LYNN
WATER & SEWER
COMMISSION

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April 30, 2013

Mr. George Harding
Water Enforcement Unit
United States Environmental Protection Agency
Region 1
5 Post Office Square, Suite 100
Boston, MA 02109-3912

Subject: Capacity, Management, Operation and Maintenance (CMOM) Long-Term Preventive Maintenance Plan
EPA Administrative Order by Consent Docket No. 12-009

Dear Mr. Harding:

Enclosed please find a copy of the Lynn Water and Sewer Commission's CMOM Long-Term Preventive Maintenance Plan.

This document was prepared in response to the EPA's Administrative Order of Consent (AOC) findings as defined in Paragraphs II.5 through II.23 and specifically addresses the terms of the AOC as outlined in Paragraph III.1.

The Commission is committed to improve their Small MS4 system performance and its CMOM program and we will be focusing our efforts on utilizing the Corrective Action Plan and Long-Term Preventative Maintenance Plan.

If you have any question or request additional information, please do not hesitate to contact LWSC Chief Engineer Anthony Marino at 781-596-2400.

Sincerely,

D F O'Neill, P.E.

Daniel F. O'Neill, P. E.

Executive Director

Lynn Water and Sewer Commission

c: Kevin Brander, P. E., MassDEP NERO
Anthony Marino, P.E., LWSC
Tony Omobono, P.E., CH2M Hill

Final Report

Capacity, Management, Operations, and Maintenance Long-Term Preventive Maintenance Plan

Prepared for

Lynn Water and Sewer Commission

April 30, 2013

CH2MHILL®

18 Tremont Street
Suite 700
Boston, MA 02108

Contents

Acronyms and Abbreviations

AOC	Administrative Order by Consent
CAP	Corrective Action Plan
CCTV	closed circuit television
CMMS	computerized maintenance management system
CMOM	capacity, management, operations, and maintenance
CSO	combined sewer overflow
EPA	Environmental Protection Agency
FOG	fats, oil, and grease
GIS	geographic information system
I/I	infiltration/inflow
IMS	information management system
LF	linear feet
LWSC/the Commission	Lynn Water and Sewer Commission
LTPMP	long-term preventive maintenance plan
NASSCO	National Association of Sewer Service Companies
O&M	operation and maintenance
OJT	on-the-job training
OSHA	Occupational Safety and Health Administration
PACP	Pipeline Assessment and Certification Program
PPE	personal protective equipment
QA/QC	quality assurance/quality control
SSO	sanitary sewer overflow
SOP	standard operating procedure
WWTP	wastewater treatment plant

SECTION 1

Introduction

1.1 Background

The Lynn Water and Sewer Commission (the Commission/LWSC) prepared a Capacity, Management, Operations, and Maintenance (CMOM) Long-Term Preventive Maintenance Plan (LTPMP) as a requirement of the findings of violation and Administrative Order by Consent (AOC) (Docket No. 12-009) with the U.S. Environmental Protection Agency (EPA) issued on September 19, 2012.

The LTPMP is a reference guide for routinely and systematically inspecting and maintaining all components of the sanitary and combined collection system including gravity sewer lines, manholes, pump stations, force mains, catch basins and special structures. The LTPMP is moving the Commission from a reactive to proactive sewer maintenance and offers an effective program that will work to increase system performance and assist in controlling the potential of sanitary sewer overflows (SSOs) and combined sewer overflows (CSOs) within the Commission's collection system.

1.2 Report Organization

The contents of this LTPMP are organized around seven major topics covered in separate chapters as follows:

- Section 2, *LTPMP Overview*, outlines the Long-Term Preventive Maintenance Plan and presents goals, key attributes and components of the plan.
- Section 3, describes field procedures to assist the Commission staff and/or contractors in performing preventive maintenance. Standard operating procedures are included in Appendix A.
- Section 4, explains maintenance frequencies established for different activities and a protocol to assist in assigning a maintenance frequency for gravity lines inspection and cleaning with influencing factors including depth and rate of grease and debris accumulation and root intrusion and growth in pipes, and occurrences of SSO and CSO events.
- Section 5, *Resources,* identifies personnel and equipment needed to meet the program goals. The Commission utilizes in-house and external resources to perform inspections, hydraulic cleaning, and/or root removal on a predetermined frequency.
- Section 6, *Forms*, describes development and implementation of standard forms to be used in collecting field information and documenting field activities.
- Section 7, *Data Management and Record Keeping*, gives recommendation for record keeping in the management information system (MIS).
- Section 8 *Performance Measures,* describes measures for evaluating the implementation of the plan, including performance in meeting the goals of the program.
- Section 9, *Training and Safety,* specifies training needs for the Commission staff at the onset of the program and continuing training thereafter.
- Section10, *Implementation Schedule*, specifies dates when the LTPMP will start implementing and the first progress report will be submitted to the EPA.

1.3 Distribution and Maintenance of the Long-Term Preventive Maintenance Plan (LTPMP)

The LTPMP is not meant to be a static document and will be reviewed annually and edited as required to reflect any changes in target performance goals, staffing, equipment, and regulation.

A hard copy of the LTPMP will be maintained at 400 Parkland Ave, Lynn, MA 01905 and an electronic copy on LWSC common drives.

1.4 LTPMP Overview

1.4.1 Introduction

The Long-Term Preventive Maintenance Plan (LTPMP) encompasses procedures for Commission's routine maintenance activities with focus on sustaining the wastewater collection system's hydraulic capacity for conveying wastewater. Typically, two different classes of problems can reduce hydraulic capacity: operational and structural. Operational defects include accumulation of fats, oils, and grease (FOG); sediment buildup; or roots intrusion and growth in the pipe; and structural defects involve the degradation of the sewer pipe itself which can lead to pipe failure. Both types of defects can cause complete or partial pipe blockage resulting in an SSO. The EPA defines SSOs as:

> "Any overflow, spill, diversion, or release of wastewater from, or caused by Agency's Collection System. SSOs include, but are not limited to, discharges to waters of the United States from the Agency's Collection System, as well as any release of wastewater from the Agency's Collection System to public or private property that does not reach waters of the United States, including wastewater backups onto public streets, into buildings, or onto private property."

SSOs can cause or contribute to environmental and human health impacts, and result in water quality standards violations, contamination of drinking water supplies, beach closures, etc.

Every sanitary sewer system has the ability to have an SSO and blockages, structural failures, insufficient capacity, high levels of inflow and infiltration during wet weather can have significant contribution to SSOs. Properly planned and implemented maintenance activities, including sewer cleaning and maintenance repairs, minimize SSOs (and CSOs as applicable) occurrences. Sewer cleaning and source control activities are directed toward preventing or reducing the impacts of operational defects on the collection system. Sewer maintenance repairs are focused on correcting defects early on when still minor and before developing into severe defects.

1.4.2 Goals

The Commission recognizes the importance of protecting the public health and the environment by preventing SSOs as well as hydraulic overloads. By establishing a proactive, system-wide, operation, maintenance, and management approach the Commission will reduce the risk of SSOs within the collection system and extend the life of the collection system components. The goals of the Long-Term Preventive Maintenance Plan (LTPMP) are to:

- Protect the large investment in collection system assets by maintaining adequate capacities and extending useful life
- Prioritize budgets related to collection system maintenance, capital repair and replacement
- Maintain wastewater collection system to render its full capacity to convey flows
- Perform all operations in a safe manner to avoid personal injury and property damage
- Minimize SSO and CSO occurrences and prevent unnecessary damage to public and private property and public health hazards
- Educate the public regarding the identification and reporting of SSOs and CSOs

1.4.3 Plan Requirements

Building and implementing a long-term preventive maintenance plan for wastewater collection systems is based on the following:

- Detailed collection system inventory
- Standardized operating and maintenance protocols

- Good documentation and data management
- Comprehensive training

Detailed Collection System Inventory: At the time of preparing this LTPMP, the Commission has started the process of inventorying the collection system components. The Engineering Department is conducting manual review of hard-copy as-built drawings and cataloguing the system inventory in Excel. As detailed inventory has not been completed, relevant attributes and characteristics of the collection system (such as total length per pipe size, pipe material, pipe age, number of manholes and catch basins in the system) used for building the plan are not precise. The planning is based on estimates that are made by extrapolating data extracted from the partial geographic information system (GIS) mapping of the sewer collection system which represents approximately 60 percent of the system. The Commission has begun evaluating the inventory of collection system assets by reviewing the original as-builts. When the inventorying of all assets is completed, the plan will be updated to adjust resource needs and cost estimates for maintenance activities appropriately.

Standardized Operation and Maintenance (O&M) Protocols: The LTPMP offers O&M protocols, including standard operating procedures (SOPs), for various sewer inspection and maintenance activities that the Commission staff and/or contractors should follow when performing preventive maintenance. Having standard protocols in place helps field crews perform activities in a consistent and proper manner and allows auditing and monitoring of these activities for quality assurance.

Documentation and Data Management: Effective sewer maintenance and cleaning programs are founded upon good record keeping in an accurate and retrievable form. The information should be organized to identify every sewer and manhole in the system with all of the relevant data on pipe diameter, slope, material, age, condition, cleaning history, spill/stoppage/problem history, and any other pertinent information supplied by inspectors, cleaning crews, or CCTV records. This type of record keeping can best be maintained in a suitable computerized system, which provides ready information access to planners, designers, inspectors, and O&M personnel. The Commission does not have any such software but purchasing a commercial information management system (IMS) that links GIS data and work order management in one visible geo-database format is under consideration.

Comprehensive Training (Applicable Occupational Safety and Health Administration (OSHA) and Confined Space Training): The LTPMP calls for training of administrative and field staff, which should be provided by the Commission and training records maintained.

1.4.4 Plan Components

The LTPMP is comprised of several individual components for addressing operational and structural defects throughout the sanitary and combined collection system, i.e., in gravity sewer lines, manholes, pump stations, force mains, catch basins and special structures, as shown in Figure 1-1. The implementation of these components will reduce normal emergencies in the wastewater collection system operation such as pipe breaks or pipe blockages and minimize the effects of extraordinary emergencies due to high-intensity wet weather events. Infrastructure replacement and rehabilitation projects are performed in parallel with the preventive maintenance. These projects are focused on correcting serious structural defects in the system and/or persistent operational problems which require prolonged or high-frequency maintenance.

Routine Manhole Inspections – Routine manhole inspections are for identifying structural and operational defects in manholes. For the first ten years of implementing the LTPMP, system-wide manhole inspections will include lamping of all pipes connected to manholes and be performed at such accelerated rate to access operation conditions in the entire wastewater collection system within ten years. This inspection program will help prioritize scheduling of gravity line cleaning..

Routine Manhole Maintenance –"Small" maintenance repairs such as replacement of leaky/missing covers or patching of cracks will be performed on an as needed basis. Systematic cleaning and removal of debris from manholes is performed in conjunction with gravity lines cleaning.

Gravity Line Preventive Maintenance – Gravity line maintenance will be prioritized and scheduled as it is identified through the manhole inspection and lamping program. The objective of Gravity Line Preventive

Maintenance is to reduce the impact of roots, debris, sediment, and FOG on the hydraulic capacity of the gravity sewer lines. It also minimizes the contribution of the operational defects to line blockages and sewer overflows from the collection system. The program includes the following:

- **Preventive Line Inspection and Cleaning** – Systematic inspection and planned cleaning of gravity lines to address debris accumulation, grease buildups, root intrusions, and inspection that identifies structural and operational defects in sewer lines affecting sewer system performance. Performed for entire wastewater system over a period of ten years, with the exception of sewer siphons inspected once every year.
- **Priority Line Cleaning** – Gravity line cleaning program that uses past event history and sewer line inspection data to schedule and implement hydraulic cleaning and inspection at defined frequencies. Performed on an as-needed basis in sewer lines with observed accelerated rates of grease, debris or roots accumulation or/and in areas known to have recurring SSOs due to pipe blockages.
- **Chemical Treatments** – Preventive root control program in areas that are known to have recurring SSOs or premature structural damage due to root intrusion. Performed on selected lines every 3 to 5 years.

Catch Basin Preventive Maintenance includes:

Routine Catch Basin Cleaning – Systematic inspection and cleaning of catch basins performed for entire wastewater system annually.

Force Main Preventive Maintenance includes:

- Routine Inspection of Force Mains – Systematic inspections including walking right-of-way of each force main, external pipe inspection and discharge manhole inspection to determine need for the force main cleaning. Performed once annually on all force mains.
- Force Main Maintenance – Cleaning of force mains will be performed on an as-needed basis.

Pump Stations (PS) Preventive Maintenance includes the following:

Routine PS Inspections – Regular inspection of pump stations performed with rotating assignments on established inspection schedules such as 3-times-per-week , weekly, monthly and annually.

Routine PS Maintenance – Planned physical, electrical and mechanical maintenance of pump stations based on run hours.

Special Structures Preventive Maintenance includes the following:

Routine Inspections – Regular inspection of regulators, CSOs, and tide gates performed for all structures monthly.

Routine Maintenance – Maintenance activities performed on as-needed basis.

1.4.5 Target Performance Measures

The LTPMP has established the target wastewater collection system maintenance goals based on a one to ten year frequency and using best estimates for footage of sewer line segments and number of manholes and catch basins in the system. These goals are listed in Table 1-1 and will be used as target performance measures.

The LTPMP also established priorities for the Commission to help focus efforts in collection system management as described in Section 0.

FIGURE 1-1.
Long-Term Preventive Maintenance Plan Components

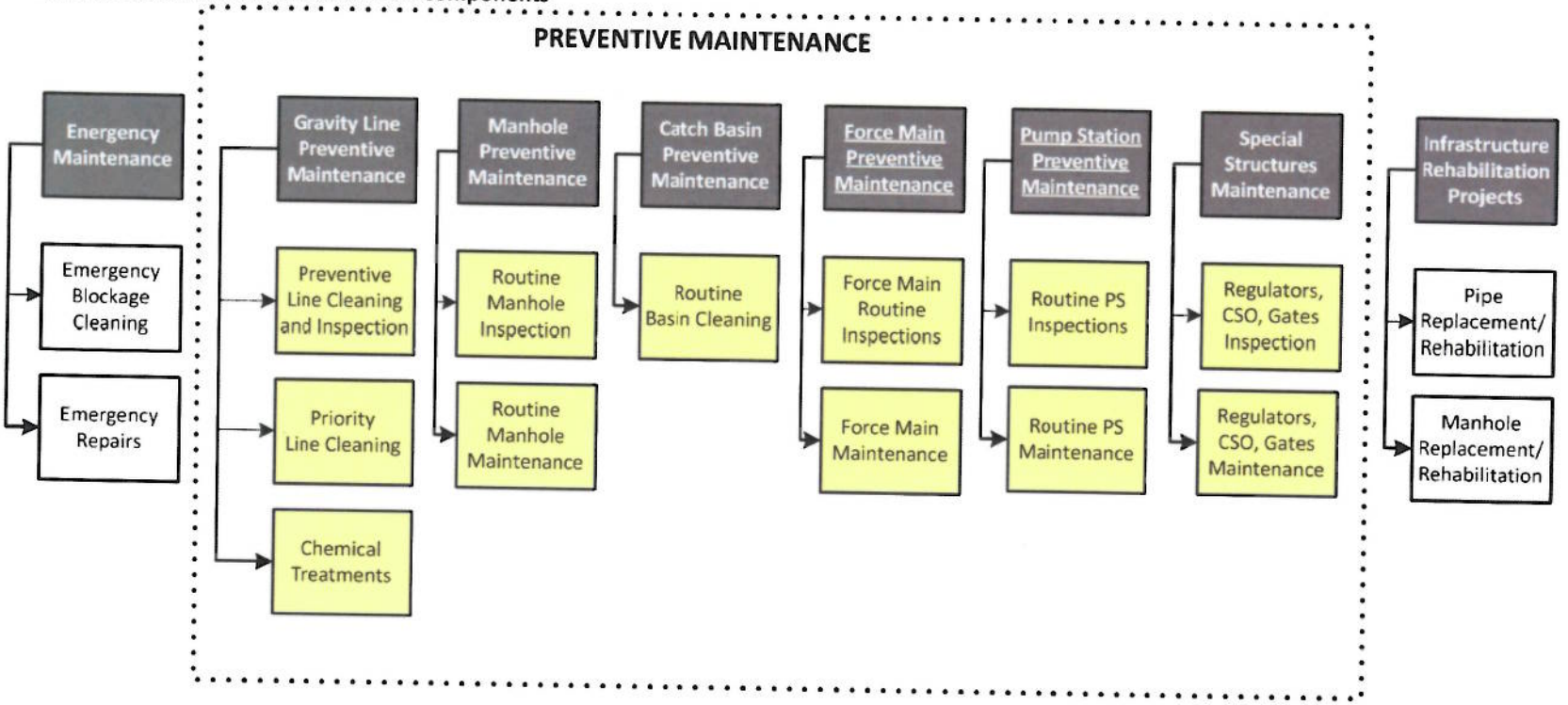


TABLE 1-1
LTPMP Maintenance Goals

Component	Maintenance Goals	Return Period*
Preventive Inspection of Manholes and Pipe Lamping	111,000 ft (21 miles) annually	7 years
Priority Cleaning of Gravity Sewer Line	Scheduled pending lamping results	NA
Chemical Root Control	Scheduled pending lamping results	NA
Manhole Inspections	748 manholes (14%) annually	7 years
Catch Basin Cleaning	3,000 basins (100%) annually	1 year
Force Main Inspection	15 force mains, total 4,300 ft (100%) annually	1 year
Force Main Cleaning	On as-needed basis.	NA
Pump Station Inspections	14 PS 260 times annually	NA
Regulator, CSO, Gates Inspection	All structures (100%) Monthly	Monthly
Regulator, CSO, Gates Maintenance	On as-needed basis.	NA

* Time required to complete the maintenance activity on entire collection system, e.g., all gravity sewer lines, all manholes, all force mains, etc.

SECTION 2

Preventive Maintenance Procedures

2.1 Introduction

This section provides consolidated guidelines and description of procedures for different aspects of the Commission's sewer system preventive maintenance. Standard operating procedures (SOPs) for selected procedures are included in Appendix A.

2.2 Gravity Sewer Line Inspection

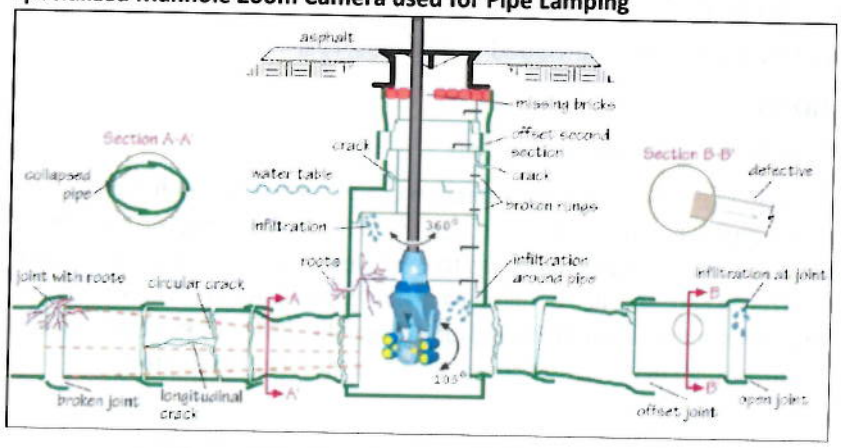
2.2.1 Pipe Lamping

Pipeline lamping is performed in conjunction with manhole inspection and consists of looking directly through a section of the sewer line from inside a manhole. The purpose is to visually examine the condition of the pipe within viewing distance of the manhole. Lamping, while providing only limited information, has considerable value in collection system maintenance because it is an economical and fast method of determining if a sewer line is clear or filled with grease, roots or debris.

Lamping is preferably done without entering manhole (as a top-side manhole inspection) by the aid of a pole-mounted zoom (Figure 2-1). A zoom camera offers more illumination and improved low-light viewing than digital cameras and offers between a 75 and 250-foot view range (in pipes, 6 to 60 inches) but is more difficult to use.

FIGURE 2-1

Specialized Manhole Zoom Camera used for Pipe Lamping



In manholes whose depth in greater than 25 ft, man entry becomes necessary because of pole length limitation. Lamping can be hazardous anytime a worker enters a manhole and confined space entry safety procedures should be followed There should always be at least one person working on top of a manhole as a safety standby person.

The standard operating procedure (SOP) for pipe lamping is included in the SOP for manhole inspections, in Appendix A.1.

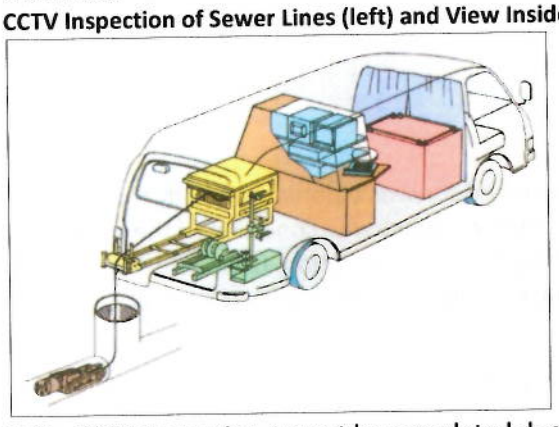
2.2.2 CCTV

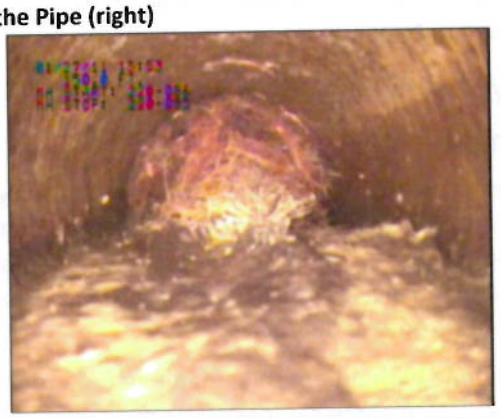
Closed circuit television (CCTV) is another method for routine sewer line inspection. A camera is mounted on a movable platform capable of traveling along the pipe, thus allowing examination and evaluation of the entire length of the pipe (Figure 2-2). The camera is used in conjunction with a video monitor and video recorder or other recording devices. The inner surface of the pipe is videoed during the inspection and recorded images are reviewed during or after the inspection.

The line segments are evaluated for operational defects including roots, grease, and debris, structural defects such as cracks, open or displaced joints, broken pieces and pipe collapse, and evidence of infiltration. Location and condition of sewer lateral connections are also documented.

The inspections can be performed without prior pipe cleaning to document the existing operational defects in the pipe or after pipe cleaning to verify the effectiveness of the cleaning and identify defects in the pipe that would otherwise be missed.

FIGURE 2-2
CCTV Inspection of Sewer Lines (left) and View Inside the Pipe (right)





If the CCTV inspection cannot be completed due to a partial or complete line blockage, the camera is withdrawn and the inspection performed from the opposite pipe end. If obstruction in a line is not passable from either end, or if the camera can be damaged from encounters with roots or grease deposits in dirty lines, the inspection is interrupted, the line cleaned, and the televising redone after the cleaning is completed.

The standard operating procedure (SOP) for CCTV inspections is included in Appendix A.2.

2.2.3 Large Interceptor Inspections

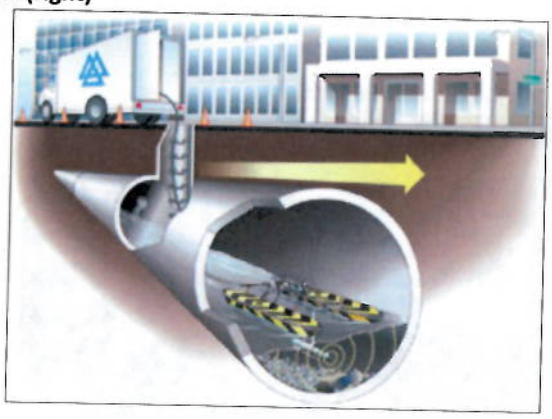
Methods for inspecting large size pipes, such as 48 inch diameter and larger,

Walk- Through Inspections: Direct visual inspection involves a sewer inspection crew walking through pipelines 48 -inch diameter and larger to check for cracks, pipe or joint separations, corrosion, root intrusion, obstruction, and other pipeline defects. Inspectors can use manually operated cameras for detailed pictures or illustrations for reports, instructions, or maintenance work. Extreme care should be taken to provide adequate safety measures. Accessing large and deep sewers in active service for walk-through inspections is usually difficult because of deep manholes, long reaches between manholes, and/or high dry weather flows, and this method has limited applicability.

Sonar inspections use sound waves to document the level of sedimentation beneath the water's surface. The sonar equipment is deployed similar to CCTV camera, i.e., a device is floated down the sewer, which in the process is scanning the full wetted perimeter of the sewer. **Laser profiling** is a technology that uses a laser beam to scan the interior of a pipe and determine its shape, alignment, diameter and capacity, as well as pipe defects such as surface cracks, corrosion (from pipe inside surface) and deposits.

The two methods, sonar inspection and/or laser profiling, can be combined with CCTV. Application of these methods requires specialized equipment and professionals so it may be necessary for contracted crews to perform the work.

FIGURE 2-3
Walk-through Visual Inspections (left) and Sonar Inspection (right)



2.2.4 Siphon Inspections

The Commission's collection system includes three siphons which have one, two or three barrels.

A siphon, or depressed sewer, is a dip in a pipeline designed to pass under something, such as a stream or conduit. An inverted siphon is always full of wastewater under pressure and below the hydraulic grade line of the collection system.

The lack of scour velocity in these lines often results in the deposition and accumulation of grit and debris, which could accumulate to the point of failure. In some cases, corrosion may result in siphons as a result of the operation.

FIGURE 2-4
Siphon Inspection

Inspections in fully surcharged conditions cannot be undertaken by conventional CCTV and each siphon barrel must be dewatered prior to performing CCTV inspection. In contract, sonar inspections are very appropriate for inspecting pipes filled with flow (see 2.2.3).

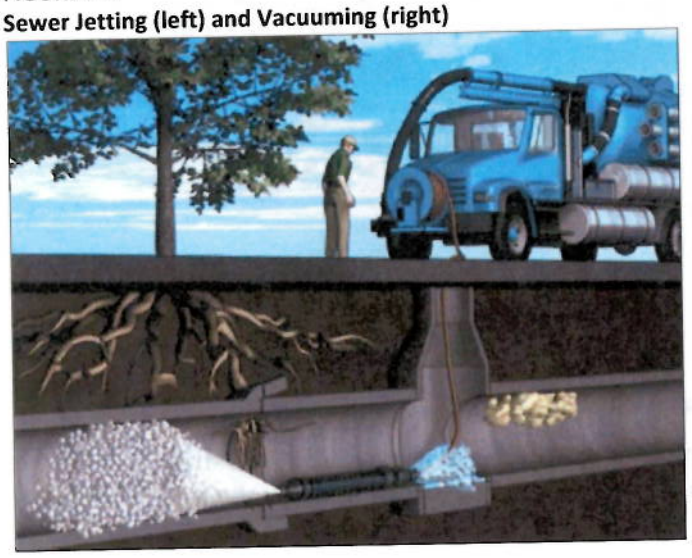
2.3 Gravity Sewer Line Cleaning

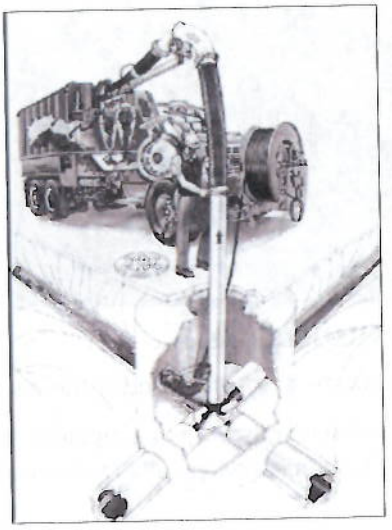
2.3.1 Hydraulic Line Cleaning

Hydraulic cleaning is performed by sewer jetting and vacuuming. Sewer jetting applies streams of high pressure water for use within pipes for cleaning and debris removal. Water at the correct high pressure can cut roots, dissolve blockages, emulsify grease and soaps while spray washing pipe wall surfaces. As part of the jetting process, the water from the nozzle can also wash away accumulated dirt or debris on the bottom of the pipe at the same time. Vacuuming is used to pump sludge and debris, which are the spoils from high-pressure jetting,

from the base of a manhole. A proper size debris trap must be inserted in the downstream invert of the downstream manhole to trap the debris released by cleaning.

FIGURE 2-5
Sewer Jetting (left) and Vacuuming (right)

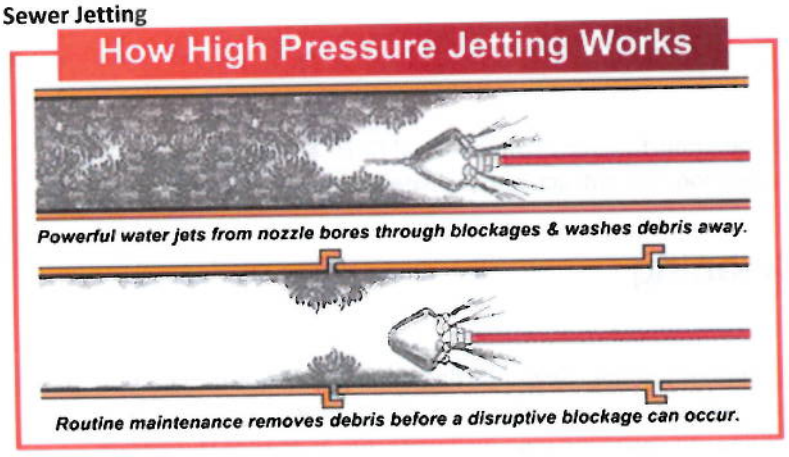




The Commission's equipment includes a sewer jetter featuring a 1500-gallon water tank and a 300-foot hose reel which telescopes and rotates for optimum positioning, and a vactor, with a 5-yard debris tank.

In sewer jetting, a jetting nozzle is attached to the end of a length of high pressure hose with the other end connected to a high pressure water pump (Figure 2-6). Jetting nozzles have small precision machined orifices or jets to restrict water flow from the jetting pump thus causing high pressure to build within hose. As the pressurized water is expelled from the nozzle jets it reverts from pressure to velocity (speed) creating thrust that allows the nozzle to pull the jetting hose. With the system pressurized, high pressure jetting hose coiled on a hydraulic powered hose reel (up to 500 feet) is released by the operator who controls the travel speed and distance of the nozzle up the pipe. Pressurized water expelled from the nozzle jets cleans debris, removes pipe blockages or roots from the inside of the pipe while traveling through the pipe. When the hose is being rewound onto the hydraulic reel, water from the nozzle jets forms a curtain or wall of high pressure water that forces (or rakes) the debris downstream. Sewer jetting technology can be applied to clean all size pipe diameters with the appropriate size of high pressure jetting unit.

FIGURE 2-6
Sewer Jetting



For quality assurance/quality control (QA/QC), hydraulic cleaning is followed by an inspection on the same day or the next scheduled work day and no later than two weeks from the pipe cleaning. Engineering Department will randomly review 10 percent of the tapes. An objective guideline for determining whether performed sewer cleaning passes or fails the cleaning quality is based on 90 percent of the pipe cross-section being clear of grease, roots, sediment, debris, or obstructions. The QA/QC results provide feedback to the sewer cleaning crews and may result in a modification of the sewer cleaning process, practices, techniques, and tools to improve sewer cleaning quality if needed.

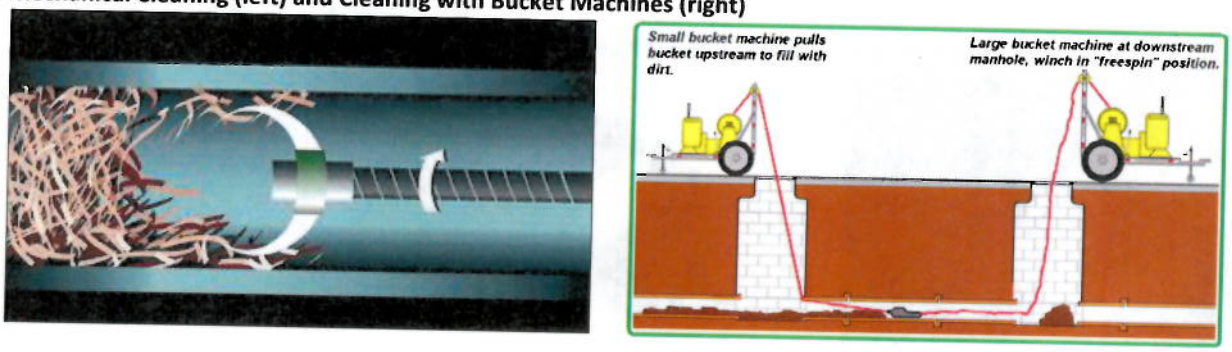
The standard operating procedure (SOP) for Hydraulic cleaning is included in Appendix A.3.

2.3.2 Mechanical Line Cleaning

Mechanical cleaning uses mechanical rods and/or buckets to remove large or hardened debris. It is rarely needed because hydraulic cleaning is typically effective in removing nearly all debris and blockages in the line with multiple passes, and generally achieves better performance and higher productivity than mechanical cleaning. Mechanical cleaning is used on an as-needed basis for large debris that is difficult to flush downstream and difficult to collect, and in cases where hydraulic cleaning was tried unsuccessfully.

The equipment includes a sewer rodder with mechanical rods and cutters which break up grease deposits and loosen debris (Figure 2-7 left). For heavy sand deposits, a cable-drawn bucket is used, especially for storm sewers and larger sanitary sewers. The cable may be pulled by a hand winch, by a power winch, or by a truck with the cable through an anchored sheave. The sewer can be damaged if the bucket catches on misaligned joints, improper house connections, or other fixed obstructions, especially with power-driven buckets. Figure 2-7 (right) depicts pipe cleaning with two bucket machines. When in operation mode, the smaller machine drags the bucket into the pipe (upstream) until the bucket or scoop is filled. Then, the larger machine pulls the bucket to the downstream manhole to empty the bucket. The process is repeated many times, interchanging or upsizing buckets and scrapers as the pipe becomes cleaner.

FIGURE 2-7
Mechanical Cleaning (left) and Cleaning with Bucket Machines (right)



Mechanical cleaning also includes mechanical root removal where root cutters (root sawing) are used to clean tree roots. The mechanical root removal cleaning operation alone typically does not remove roots completely to leave a clean-shaven pipe. A mechanical root cutter pokes a hole through the root mass, for example, an 8 inch root cutter cleans a 4 to 6 inches pathway, and the cleaning operation should be combined with jetting activity.

The standard operating procedure (SOP) for Hydraulic cleaning is included in Appendix A.4.

2.4 Chemical Root Control

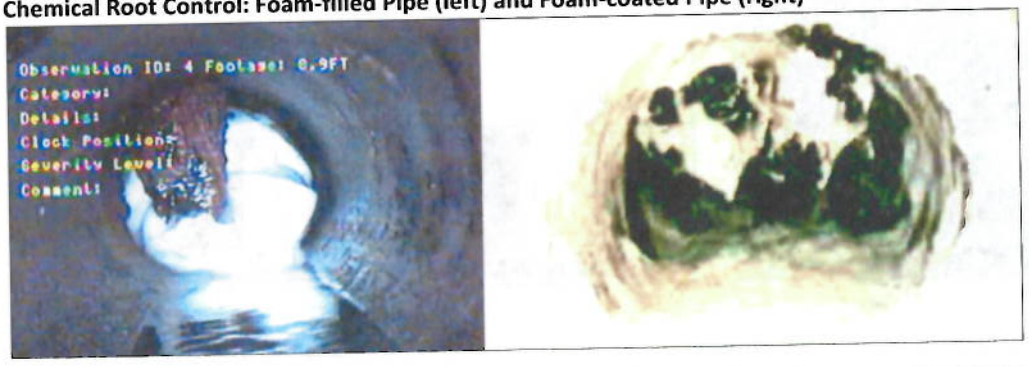
Hydraulic cleaning and mechanical root cutting provide immediate, but temporary relief from protruding roots. Mechanical root cutting in fact stimulates vigorous root re-growth and roots need to be cut more frequently to avoid blockage. Chemical root control is another approach which applies herbicides to kill existing roots and retard their future growth and thus offers more lasting relief in lines with persisting root problem. Chemical root control consists of introducing chemicals to identified problem areas designed to eliminate intrusive root growth for a period of three years or more.

Application of the chemical should be done only by a licensed professional so it may be necessary for contracted crews perform the work. The hose insertion method is the most common way of applying foams to sewer lines. A foam delivery hose is inserted through the section of pipe to be treated. Foam is then pumped from a foam generator through the hose while it is being retracted at a predetermined rate. Hydrojetters or rodding machines may be needed to move the hose into the pipe and position it before starting the foam application. If this is necessary, the foam generation equipment is adapted so it can be attached to a standard high-pressure hydrojetter. When using jetters it is recommended that a moderate pressure be used rather than very high pressure. High pressures and excessive cleaning may result in excessive root damage which can affect the effectiveness of the root control application. If a jetter is used, the end of the hose is fitted with a two stage nozzle. The first stage works with water pressure and uses this force to pull the hose through the pipe. Turning off the water causes the large portion of the nozzle to open. This provides an unrestricted flow of the foam which will be pumped through the hose while it is being retracted.

A professional root control applicator can apply the chemicals in minutes. The treatment kills the roots on contact but it takes two to four months for the roots to decompose and begin to slough off. Normal flow conditions in sewer lines can typically easily wash away the dead roots but in low flow conditions, the dead roots may continue to cause blockages and the most common practice is to have the sewer line hydraulically/mechanically cleaned after the chemical treatment to help prevent the dead roots from continuing to be a nuisance.

Foam is the best carrying agent to deliver the root killing chemicals because foam consists of millions of small, densely compacted bubbles which trap the active ingredients in between the bubbles and hold it against the roots to provide the contact time needed for the ingredients to work effectively. Chemicals, with a thick foam consistency, travel through the pipe completely filling the dead air space in the pipe (Figure 2-8). The sewer service is not interrupted during the treatment, and the flow will not wash the foam away for several hours. The foam will cling to the top and the sides of the pipe while the flow passes safely underneath. A minimum of one hour is needed for most successful applications, although some foam's may remain in the treated pipe for up to 12 to15 hours.

FIGURE 2-8
Chemical Root Control: Foam-filled Pipe (left) and Foam-coated Pipe (right)



A post-treatment effectiveness evaluation of chemically treated gravity sewer lines will be performed with CCTV inspection scheduled approximately 4 months after the treatment.

2.5 Manhole Preventive Maintenance

2.5.1 Manhole Inspection

Manhole inspection techniques include visual inspections of the condition of manhole structure and pipe connections, and many include lamping of connected pipes. The inspection can be done without or with entering the manhole (see discussion in 2.2.1 and Figure 2-9).

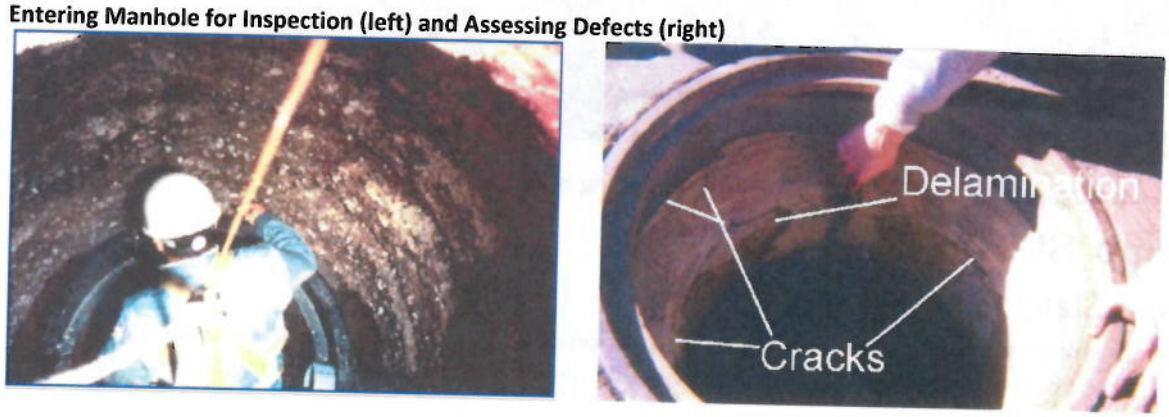
The purpose of a manhole inspection is to look for evidence of inflow from manhole covers; evidence of surcharge; problems with the condition of the cover and frame; offsets or misalignments; the presence of hydrogen sulfide; problems with the condition of interior (cone, walls, bench, trough, and pipe seals); accumulation of grease, debris, or grit; and the presence of corrosion. An effective method of finding leaking

manholes is to do inspections during a period of heavy rainfall or high water table conditions. Leaks are noted and usually sealed right away and more serious defects are repaired later.

A two-man crew can inspect an average of 15 manholes per day with or without man entry. In larger pipes, such as 18 inches in diameter or larger, the presence of hydrogen sulfide is frequently an issue requiring manhole ventilation which slows down the inspection and daily production rates considerably and the crews can complete on average up to 10 manholes per day.

A manhole structure is a confined space that presents possible fall hazards and there is a potential for toxic gases to be present. The personnel working around open manholes and preparing to enter the manhole must use safety equipment and follow general manhole safe work practices listed in Appendix A.1.

FIGURE 2-9
Entering Manhole for Inspection (left) and Assessing Defects (right)



The standard operating procedure (SOP) for manhole inspection is included in Appendix A.1.

2.5.2 Manhole Maintenance

Routine sewer maintenance includes cleaning and removal of debris from manholes, which is performed as part of gravity lines cleaning. Additional maintenance includes replacement of leaky or missing covers and simple repairs such as patching of leaking cracks. Bolt-down manhole covers are considered for installation where missing covers appear to be evidence of vandalism. Other manhole repairs such as rebuilding of bench and channel, replacement of entire manhole, etc. are excluded from preventive maintenance and are completed as part of infrastructure rehab projects.

The standard operating procedure (SOP) for sealing manhole covers to eliminate noise or odors is included in Appendix A.5.

2.6 Catch Basin Preventive Maintenance

Catch basin preventive maintenance entails catch basin inspection, cleaning, safe storing, and disposing of collected cleanings. Cleaning is recommended anytime the level of debris in a catch basin comes within 18 inches of the outlet to the sewer system and as required per the pre-cleaning inspection.

Catch basins are typically cleaned using a truck equipped with a hydraulic clamshell bucket (Figure 2-10, right). Such a bucket is lowered into the catch basin where it hydraulically grabs the dirt and debris, like a hand making a fist, squeezing out water as it closes, and is then raised up and unloaded into its attached dump truck for disposal. Catch basins can also be cleaned using a jetter and vactor truck. The material removed from the catch basins is dumped on a concrete pad at the wastewater treatment plant (WWTP) where it drains and is later shipped to a landfill.

The City of Lynn reportedly performs street sweeping approximately 3 times per year removing litter and debris from gutters. Street sweeping is helpful because it reduces the rate of sediment accumulation in catch basins and thus the frequency of catch basin cleaning. However, catch basin cleanings should not be mixed with street sweepings because they are generally more polluted than street sweepings.

As catch basins are cleaned, the overall condition of each catch basin is surveyed (concrete, sidewalk, and the iron grate itself examined) to ensure that there are no structural issues and basins needing repair are noted.

FIGURE 2-10
Opening Catch Basin (left) and Clamshell Bucket Mounted on a Truck used for Cleaning (right)

The standard operating procedure (SOP) for catch basin cleaning is included in Appendix A.6.

2.7 Pump Stations

2.7.1 Pump Station Inspections

Pump stations preventive maintenance entails regular inspection of all 14 pump stations in the sewer collection system to assess the operation of the pumps, buildings and wet wells, and repair any problems found before they cause costly breakdowns.

Standard operating procedures (SOP) for routine pump stations inspection at different time intervals are included in Appendix A.7 and for power backup generator inspection in Appendix A.8.

2.7.2 Pump Station Maintenance

The pump stations maintenance includes the following components:

PS Physical Maintenance - includes maintaining the condition of the building (pipes, covers, doors, vaults, windows, walls, roofs, locks, lights, etc) and the outside appearance of the structure (paint, fencing, yard maintenance, safety, and warning signs, etc).

PS Electrical Maintenance - includes building electrical system (lights, panel locks and doors, electrical enclosures), wiring, electrical motors, meters and control panels).

PS Mechanical Maintenance - includes all mechanical and electro-mechanical pieces of equipment. The maintenance is scheduled based on equipment manufacturer's recommendations (Includes oil changes, lubrication of bearings, types of lubricants, parts replacement).

Sewage pumps are probably the most important equipment in pump stations. In many instances, the causes for a breakdown of pumping equipment cannot be immediately diagnosed. Therefore, a complete understanding of pump construction and operation is essential to provide proper maintenance. Preventive and corrective maintenance records should be kept current in a suitable computerized maintenance management system (CMMS). The CMMS should function as the central repository and asset historical records. Regular inspection should be performed, taking special attention to the following:

- **Bearings:** For small horsepower pumps, bearings are a major source of problems. Close coupled pumps have no bearings because the impeller is mounted directly on the motor shaft. With vertical open shaft pumps, the pump is constructed differently and does have bearings. The plant operator must be able to recognize and report the presence of noise and unusual heat. Considering the minimal cost of bearings compared to the cost of taking out and overhauling a pump, it is more advantageous to replace bearings every time the pump is overhauled.

- **Seals**: All maintenance and repair should be as directed by the manufacturer. An adequate supply of spare parts should be kept on hand, as mechanical seal failure is sometimes abrupt with no prior warning.
- **Lubrication:** Lubrication is, without doubt, the most important function of a preventive maintenance program. Pumps should be oiled and greased at predetermined intervals in strict accordance with the recommendation of the manufacturer.

Wet Well Maintenance: One of the major O&M problems is the build-up of grit in the wet well. Such build-up may result in reduced flow to the pump as well as reduced wet well capacity. One method of grit removal in wet wells is flushing the grit to the pump's suction end with high-pressure hoses. This has the disadvantage of causing additional wear on the pump's internal parts. Another method involves manual removal by the use of a bucket. A clam shell or a bucket machine can also be employed. The wet wells require periodic attention and cleaning, as grease and other material usually build up causing odors and impairing the operation of float controls. One of the most effective methods of removing grease and associated material is by the use of a truck or trailer-mounted vacuum unit.

2.8 Force Mains

2.8.1 Routine Force Main Inspection

The Commission's force mains are relatively short in length and have no air release valves installed. A Force main operational inspection includes several inspection activities as described herein.

Force main right-of-way inspection: The inspection consists of a detailed and methodical visual inspection of each force main right-of-way to identify loss of support, earth movement, condition of features (e.g., pressure manholes), nearby construction activities, early signs of leakage, vandalism or other conditions that could lead to a force main failure. The inspections will be conducted by walking the force main right-of-way. The results will be recorded in an inspection log that notes both locations and observations. Any significant or unusual situations will be recorded using photographs.

Force main pipe internal inspection and discharge manhole inspection: The inspection consists of a detailed and methodical visual inspection to determine the condition of the exposed portions of the force main and the condition of the discharge manhole. The inspection is conducted either visually or with the aid of mirrors and/or down-hole camera systems. The inspection of the exposed portions of the force main will include observations on the condition of the coating system. Any significant or unusual situations will be recorded using photographs.

Routine pump station calibration: The procedure is performed to determine if the force main needs cleaning (if the procedure is done on an annual basis, changes in capacity and discharge head in the pump station can indicate the need for cleaning. Because these changes could also be attributed to pump wear, it is essential to verify that the pumps are in good working order.)

The results of all inspections will be recorded in an inspection log that notes both locations and observations and will be reviewed by the Engineering Department.

2.8.2 Force Main Maintenance

Force main maintenance includes pipe cleaning which is performed on as-needed basis, applying safety measures to prevent inadvertent damage from construction activities in the area or pressure surges.

Surface marking of force main is one safety measure which involves installing and maintaining surface markers above the force main at distances approximately every 100 feet or less. The markers read:

- Caution
- Buried Sewage Pipe under Pressure.
- Call LWSC at (781) 596-2406 before digging.

There is potential for pressure surges within a force main which are abrupt increases in operating pressure in force mains which typically occur during pump start-up and shut-off and have negative effect on force main

integrity. A safety maintenance measure for reducing pressure surges is the installation and maintenance of pressure surge control devices.

2.9 Special Structures

Special structures inspection consists of a physical inspection of regulator structures, weir and tide gate chambers as well as combined sewer overflows (CSOs).

It also includes any exercising or lubrication of gates and anything else not considered corrective.

Tide gate inspections are performed during low tide, which provides a good view of system components which are submerged during high tide such as hinges, trash rack, and scour control. During each inspection, a general survey is performed of the upstream and downstream area, the garbage racks are checked to be clean, the tide gates to be seating properly, and if any part of the flood control structure is damaged, and if damaged, the extent of damage and the required maintenance.

Special structures maintenance includes clearing of all blockages within regulator, gate chamber structure, including sensors within the chambers, and CSOs. The work involves regular removal of debris or sand deposits, lubrication of hinge pins, and operating the gate regularly to prevent it from being stuck.

SECTION 3

Preventive Maintenance Frequencies, Priorities and Scheduling

3.1 Overview

The frequency of maintenance activities is an important element in the development of effective maintenance program. Preventive maintenance activities in this LTPMP have frequency established based on existing operating conditions inside the pipes, manholes and catch basins, and the past history of operational problems. The performance annual goals are based on industry metrics and available resources in the Commission.

This section of the LTPMP describes how the Commission prioritizes its preventive maintenance activities, determines maintenance frequency for gravity sewer line cleaning and manhole inspections, and performs scheduling of these activities.

3.2 Gravity Sewer Lines

The LTPMP has established a goal to routinely inspect all gravity sewer lines at least once every 7 years (Table 3-1) scheduling cleaning as required. Repeat inspection will also be performed on lines that are suspected to require more frequent cleaning. With a total estimated number of manholes at 5236 and length of gravity sewer lines of 792,000 linear feet (LF) or 150 miles, preventive inspection amounts of 748 manholes and approximately 111,000 LF of pipe are expected annually.

TABLE 3-1

Routine Preventive Gravity Sewer Cleaning and Inspection Goals*

	Cleaning & CCTV
Percent Total length	14
Years to Complete	7
Inspected Annually, Manholes	748
Inspected Monthly, Manholes	62
Inspected Annually, LF	111,000
Inspected Monthly, LF	9250
Average 2-man crew daily productivity Manhole/LF	3 Manholes/440 LF

*Figures in this table are approximate values until collection system inventory is validated

Routine preventive inspection shown in Table 3-1 is appropriate for sewer line segments without maintenance problems. This would include lines that remain clean, have only minor accumulation of debris over time or will take 10 years or longer to eventually develop operational defects contributing to line blockages and sewage overflows from the collection system. Priority inspection with repeat cleaning of lines as required is a preventive approach to address areas with frequent and persistent problems and where operational defects are likely to develop and cause blockages and SSOs within 10 years time frame.

Three protocols for identifying line segments of the wastewater collection system subject to stoppages and establishing recommended frequency of prioritized preventive cleaning within first ten years of implementing the LTPMP are illustrated in Figure 3-1. They are as follows:

- Protocol #1: Perform condition assessment of operational problems in pipes by means of pipe lamping, observe cross-section area loss in pipes, clean within recommended time interval, perform additional CCTV inspection where necessary, observe trend in cross-section area loss, and recommend cleaning frequency.
- Protocol #2: Review past Work Orders, compile a list of line segments with performance issues, review history of SSOs in these line segments, and recommended inspection frequencies.
- Protocol #3: Respond to an occurrence of SSO (and CSO event as applicable), determine root cause of the incident, review history of SSOs, and recommend cleaning frequency.

Protocol #1: Pipes in the collection system are assessed in conjunction with manhole inspections as part of an accelerated manhole inspection program which will take an estimated ten years to complete system-wide. Manholes with line segments which are considered to be likely 'hot spots' in the system by the Commission's staff are prioritized for the inspection and will be the first to be inspected upon LTPMP implementation.

Lamping is used to observe any cross-section area loss due to grease/roots/debris accumulation. If a pipe is found to be clean or has minimal cross-section area loss (less than 10 percent), it will be remain on the standard inspection schedule be re-inspected within ten years. However, if a pipe identified as 'clean' through pipe lamping but is a suspect 'hot spot' line segment and viewing distance from the manhole into the pipe is limited, CCTV inspection may be scheduled to check the existing conditions inside the whole pipe. If a cross-section area loss is moderate, between 10 and 33 percent, the pipe will be scheduled for low priority cleaning within 12 months of inspection. High cross-section area losses, between 33 percent and 66 percent, trigger high priority cleaning within 3 months of inspection. Extreme cross-section area loss, greater than 66 percent, requires urgent cleaning within 1 month of the lamping. Cleaning is always followed by re-inspection on the same day or shortly after the cleaning (see 2.3).

For pipe segments requiring high priority cleaning, a repeat CCTV inspection may be performed several months after the cleaning (recommended three months after urgent or high priority cleaning, and 12 months after low priority cleaning) to observe trends in cross-section area loss. See Table 3-2.

TABLE 3-2
Cleaning Frequency Selection Guide for Gravity Sewer Line Cleaning

Priority	Cleaning Frequency (Months)	Determining Factor: Trend in cross-section area loss
High Priority	3	Getting worse
Low Priority	12	Staying constant
Add to routine preventive schedule and clean once in 10 years		Improved

Protocol #2: This protocol is performed at the beginning of each year to address problem areas within the 10-year preventive maintenance plan cycle collection system. The Commission will review Work Orders recording collection system blockages, structural failures and SSOs events within past three years. Pipes that are suspected to have repeat performance issues will be placed on a re-inspection list to evaluate current performance using pipe lamping or CCTV.

Protocol #3: Any SSO event caused by the accumulation of grease, debris, or root growth puts a Commission owned line segment on a high priority inspection schedule to establish cleaning or repair schedule. The pipe is assigned low priority cleaning schedule unless there were no other SSO incidents within past 12 months, in which case high priority cleaning schedule is recommended.

Implementation of Protocols: The three protocols will be implemented simultaneously and when applicable the highest frequency derived from two protocols for the same pipe will be selected. For example, if the pipe qualifies for routine preventive cleaning (once in 10 years) based on observations from pipe lamping (Protocol #1)

but the records indicate that priority schedule is needed (Protocol #2), then the pipe is put on the priority cleaning.

Monthly Scheduling: Monthly scheduling of line segment inspections is shown in Figure 3-2. Inspection schedules will be created one month in advance to accommodate the scheduling needs of additional services such as equipment or police details.

Modifications to Established Schedules: Based on the results of pipe inspections and analysis and collection system performance, inspection and cleaning schedules will be evaluated and modified as necessary.

FIGURE 3-1

Assigning Cleaning Frequency to Gravity Sewer Lines During the First 10-year Cycle

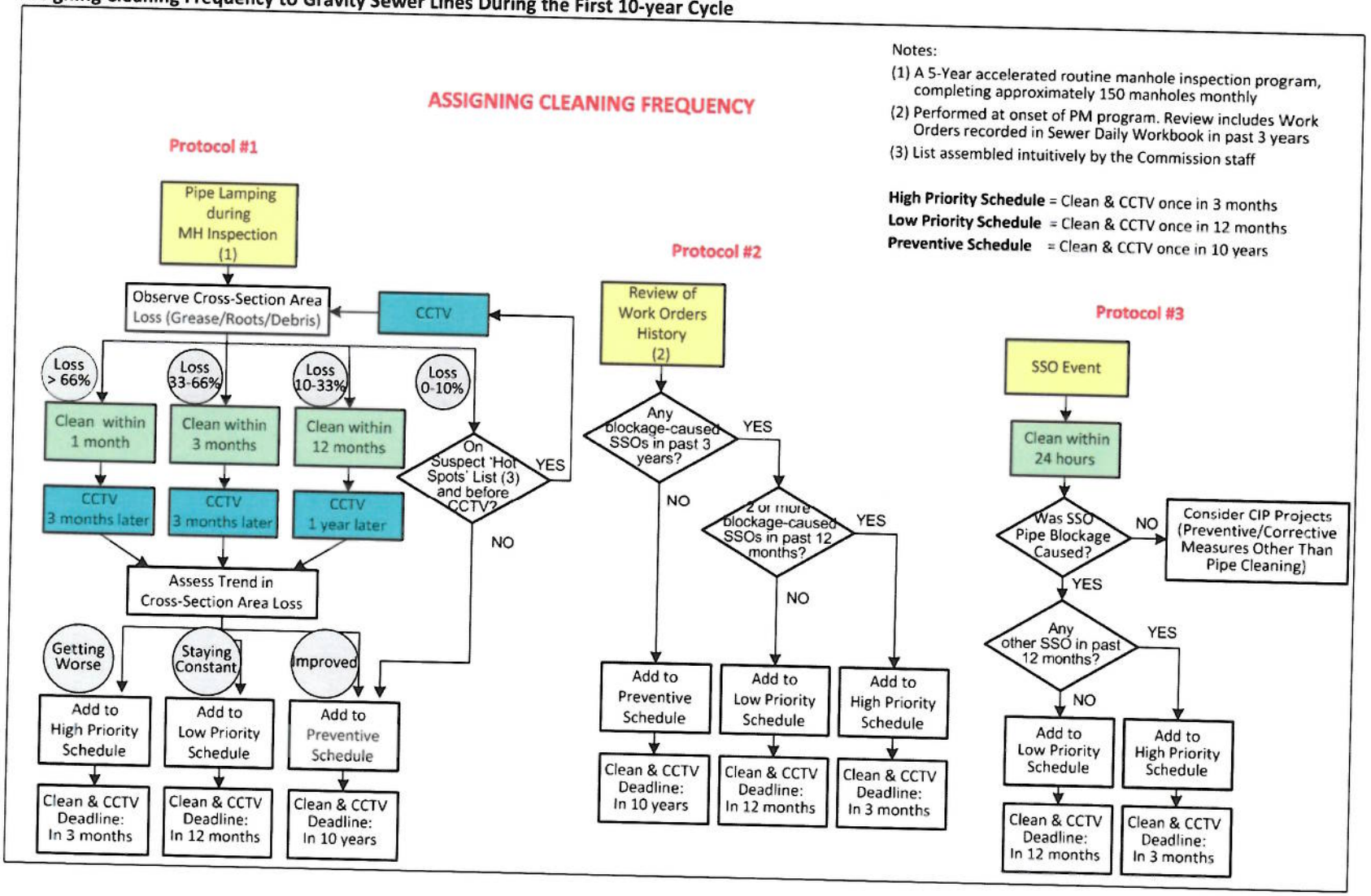
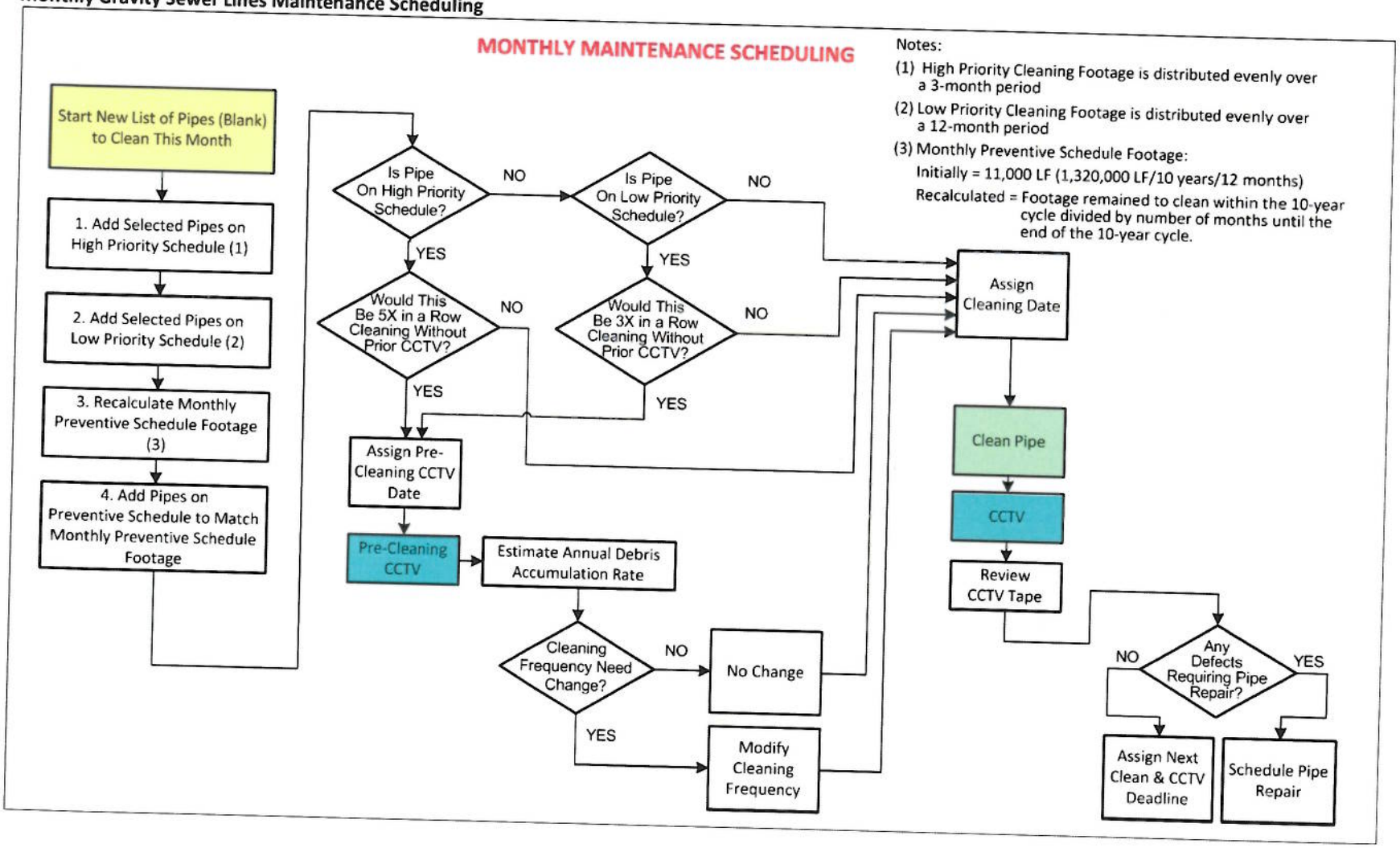


FIGURE 3-2

Monthly Gravity Sewer Lines Maintenance Scheduling



3.3 Siphons and Large Interceptors

The Commission's collection system includes four short length siphons, with total footage 185 LF. The siphons have one, two or three barrels. Siphons need to be inspected once annually and cleaned as needed. If corrosion is observed, the maintenance action may include adding appropriate chemicals to minimize the formation of hydrogen sulfide.

Wastewater flowing in large size interceptor sewers typically moves fast enough to prevent sediment from settling to the bottom of the pipe. However, bulk trash and debris, including yard or construction debris that is illegally disposed of in the sewer system, can create dams that slow the flow and allow sediment to settle. Large size sewer interceptors are routinely inspected once every 10 years. If the sewer has a depth of debris that is greater than 20 percent of the pipe diameter or if there is evidence of other maintenance problems, the pipe should be cleaned.

3.4 Manholes

Manholes provide access to sewer pipes for inspection and cleaning, and their good condition is critical for system operation. Inspections will identify manholes that need maintenance or repairs and help identify gravity sewer lines in need of cleaning.

The LTPMP has established a goal to complete a comprehensive system-wide MH inspection with lamping of sewer lines connected to manholes within a 7-year period. This accelerated inspection program will allow inspection of the whole system quickly and identifying sewer lines which need priority cleaning or priority CCTV inspection. At the end of this program, the Commission will continue to routinely inspect manholes with goal to complete system-wide MH inspections every 7 years. The details of the manhole inspection schedule are included in Table 3-1.

3.5 Chemical Root Control

Chemical root control treatments are typically repeated every 3 to 5 years although the result from one treatment can last 10 years or more. The time duration between treatments is usually related to the initial severity of the root intrusion (the more severe the root intrusion, the more frequently the application should be repeated). When evaluating lines for chemical root control frequency a contracted professional should be consulted regarding the application rate.

Sewer line segments with roots shown as a primary operational defect will be considered for chemical root control treatment on a periodic basis.

3.6 Catch Basin Cleaning

The LTPMP has established a goal of cleaning 100 percent of catch basins on both the combined and storm sewer system on an annual basis (Table 3-3) and above that to clean catch basins that accumulate more debris semiannually or quarterly.

Systematic basin cleaning is scheduled along these routes to clean catch basins in areas with the highest sediment loading, such as low spots in the town, and proceed in areas with lower sediment loading. Specifically, catch basins in high sediment load areas will be scheduled when the cleaning is the most effective, i.e., just before the wet season. Initially the priority is given to basins in areas where drain problems have been reported and that are known to flood often.

TABLE 3-3
Catch Basin Cleaning Goals, 200 8-hr Working Days Per Year

Total number of catch basins	3000
Years to Complete	1
Cleaned Annually	3000
Cleaned Monthly	250
Average 1-man crew daily productivity	10

3.7 Pump Stations

Pump station routine inspections are specified with different frequency schedules: 3 times per week, weekly, monthly and annually. The O&M of pump stations is contracted to Aqua Alliance (Veolia Water) (see Section 0) and the inspections are performed by this contractor's staff on established five times per week inspection schedule for a total of 260 inspections annually.

3.8 Force Mains

Force mains convey wastewater under pressure from a pump station to a discharge point. Any SSO resulting from a force main failure is likely to be a serious threat to the environment and the public hence the regular inspection and maintenance of force mains are critical.

The LTPMP has established a goal of inspecting all force mains once annually and will perform cleaning or other maintenance on as-needed bases.

TABLE 3-4
Force Mains Inspection Goals, 200 8-hr Working Days Per Year

Force Mains, Number	13
Years to Complete	1
Mains Inspected Annually	13

3.9 Special Structures

Inspection and maintenance of regulators, gate chambers and CSOs are critical because operational malfunction of these structures can cause a dry weather discharge. The LTPMP has established a goal of inspecting all regulators, tide gate and other structures monthly, after each activation and will perform cleaning or other maintenance on as-needed bases.

Special structures include five CSO outfalls and three tide gates. During significant rain events, excess flow to combined sewer outfalls (CSO) outfalls discharge to receiving waters (Lynn Harbor or Stacey Brook). Tide gates, acting as check valves when the sea levels are higher than the invert elevations of the outfalls, are installed at the overflow side of each regulator discharging to the Lynn Harbor.

SECTION 4

Resources

4.1 Personnel

The LTPMP personnel include a combination of internal and external resources. The Commission's personnel are available to work full time performing maintenance activities or assisting with the LTPMP, is listed in Table 4-1.

TABLE 4-1
LWSC Personnel Included in LTPMP

Position Title	Number of Authorized Positions	Responsibilities within LTPMP
Engineers	2	Responsible for planning and directing major sewer investigations, cleaning and repair projects within the Commission, GIS data quality control, analysis of system infrastructure from inspection results
Engineering Technician (possible new hire)	1	Supports engineers and superintendent with GIS and CMMS data management and analysis, work planning, SSO response management and reporting, and use of field inspection data in assigning work priorities,
Construction Inspectors	2	Responsible for inspection and approval of field work performed by contracted crews
Superintendent	1	Works to identify and repair deficiencies in the collection system; manages day-to-day operations related to sewer collection mapping and as-built inventory,; calculates quantities and updates spreadsheets and CMMS for documentation of field activities; and works with contractors to facilitate orderly completion of construction activities
Foreman	1	Responsible for completion of field work activities and completion of work records
Working Foreman	3	Serves as field crew leader. Responsible for operating heavy equipment that might include Jetter, Vactor truck, Rodder and/or other equipment to clean, inspect and/or repair sewer lines and manholes.
Construction , Class I and II	8*	Responsible for operating heavy equipment that might include Jetter, Vactor truck, Rodder and/or other equipment to clean, inspect and/or repair sewer lines and manholes.

* With one employee on disability leave, the number is effectively 7.

The following crews can be potentially assembled from the Commission's current field personnel in the Sewer division and be tentatively assigned to perform the activities as shown (see Figure 4-3):

- One three-man crew – assigned to perform priority and preventive cleaning.
- One two-man crew – assigned to perform priority and preventive cleaning.
- One two-man – designated to perform manhole inspection.
- Two two-man crews – designated to perform catch basin cleaning.

These crews may be temporarily reassigned to perform emergency pipe blockage cleaning and/or emergency pipe repairs when needed.

Additional contracted crews will be needed to meet the annual goals for line footage cleaning and maintain the scheduled cleaning frequency for line segments included on the preventive and priority maintenance cleaning lists, as shown in Figure 4-1. The number of contract crews working at any particular time will vary depending on scheduled work. Typically, the cleaning contractor will have one two-man or three-man crew assigned to the hydraulic cleaning work. The productivity goal for routine hydraulic cleaning is to complete 600 LF per day. The contractor will be required to have adequate personnel to ensure quality work and productivity to meet the obligations of the contract.

The CCTV inspection work will be performed by a CCTV contractor's crews and will be supplemented by the Commission crews when the Commission acquires the CCTV equipment and more field personnel. It is estimated

that two CCTV crews will be needed for performing the pipe inspection activities planned in the LTPMP. Chemical root control will be performed by a specialized contractor. The O&M of pump stations is contracted to Aqua Alliance (Veolia Water) under the terms of a 20-year service agreement signed on March 23, 2001.

4.2 Equipment

The Commission's equipment used for gravity sewer line and catch basin cleaning is summarized in Table 4-2.

TABLE 4-2.
Equipment for Line and Catch Basin Cleaning Activities

Equipment	Quantity	Make/model	Year
Sewer Jetter	1	International	2009
Vactor	1	International	1993
Sewer Rodder	1	Sreco	1984
Basin cleaners	2	International	2002, 1997

The following is equipment recommended for purchasing:

- A standard digital camera or manhole zoom inspection camera mounted on a telescoping pole, which would allow detailed manhole inspections without the need for confined-space entry.
- Sewer Jetter
- Sewer Vactor
- CCTV Truck

Specialized equipment such as sonar or laser inspection tools would be used on a small scale and should be contacted when needed.

FIGURE 4-1

Crews and Equipment Utilization and Planning

SECTION 5

Forms

Standard forms currently utilized by the Commission personnel for field activities include the following:

- Work Orders
- Daily Time Sheets

Example copies of forms are included in Appendix B. Forms will change with implementation of a new IMS.

Manhole Inspection Form is included in Appendix B.3.

Sewer line inspections using CCTV are recorded electronically on forms conforming to PACP standards. PACP guidelines include inspection identification, standard defect codes and ratings, and a general format for reporting results.

Standard CCTV inspection reporting is included in Appendix B.4. Contract crews are required to submit CCTV inspection data digitally on DVDs.

Sewer cleaning form for use by field crews for documenting cleaning activities is included in Appendix B.4. Information entered in this form will be used to update the Commission's GIS inventory.

SECTION 6

Data Management and Record Keeping

Good record keeping in an accurate and retrievable form is essential for effective sewer maintenance and cleaning programs. The LTPMP recommends record keeping in the Management Information System (MIS) for providing ready information access to planners, designers, inspectors and O&M personnel. The MIS would be founded on two data management tools: GIS and CMMS.

GIS: The Commission's geodatabase is used for mapping and uniquely identifying all sewer system components. The mapping and each of these components is attributed with applicable information including:

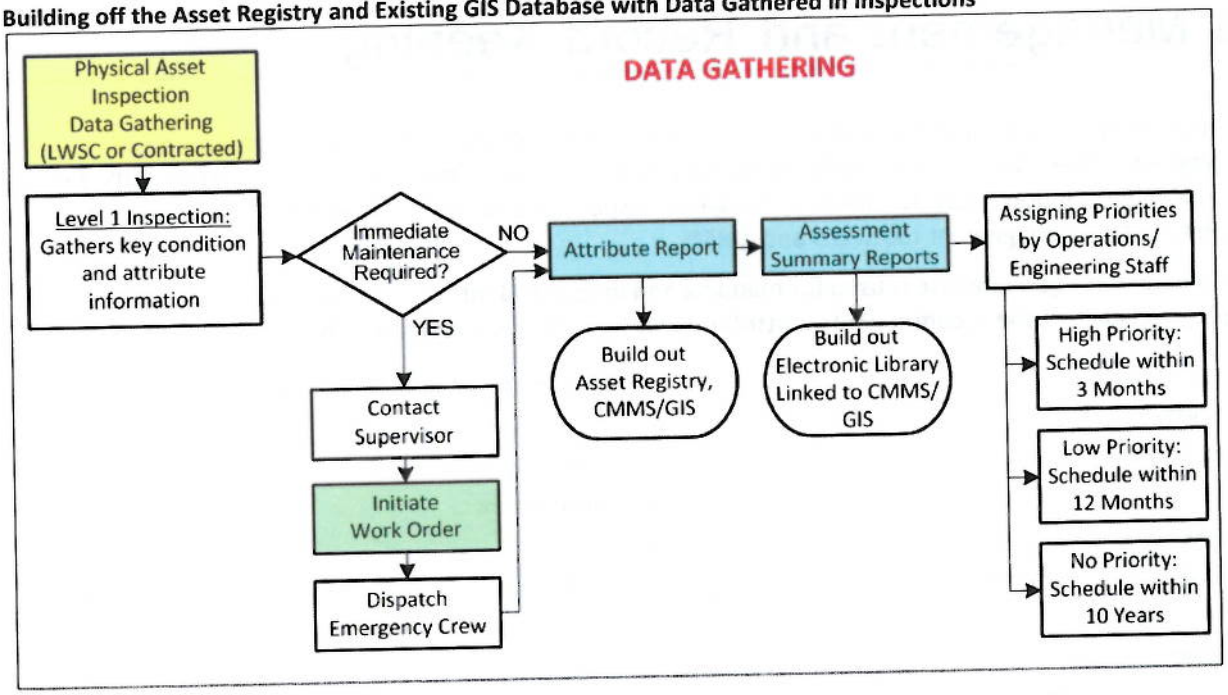
- Service area boundaries
- Property lines
- Easement lines and dimensions
- Streets
- Landmarks
- Manhole and other access points
- Manhole coordinates
- Manhole rim elevation
- Distances between manholes
- Main, trunk, and Interceptor sewers
- Water mains
- Force mains
- Pump stations
- CSOs
- SSOs

- **Sewer attributes:**
- Installation date
- Separate/combined sewer
- Size/diameter
- Shape
- Invert elevation
- Slope
- Material

- **Manhole attributes:**
- Shape
- Type
- Depth
- Age
- Material

At the time of writing this LTPMP, the existing GIS database is incomplete and the LTPMP will be used as tool to build it off. As the sewer system is inspected (manhole inspections, pipe lamping, CCTV inspections) data will be gathered to populate the GIS database with missing assets and fully attribute new and existing assets (Figure 6-1).

FIGURE 6-1
Building off the Asset Registry and Existing GIS Database with Data Gathered in Inspections



CMMS. The CMMS would serve as the data warehouse which contains the GIS asset registry, asset history, collection system problem area histories, preventive maintenance scheduling, contracted work performed and reporting.

Using MIS System. The MIS system would be used to manage workflow activities that occur in response to collection system asset management including sewer overflow events and preventive maintenance inspections and maintenance activities.

Figure 6-3, Workflow Activity Diagram for Unscheduled (emergency response) Maintenance Activities, illustrates workflow activity for scheduled maintenance activities such as routine preventive or priority inspections, cleaning or other maintenance, and Figure 6-3 for unscheduled emergency response maintenance activities. The MIS tool would also be a generation point for required regulatory reporting to state and federal agencies.

By linking work orders and tracking them in one integrated data system, implementation of the new MIS will standardize the preventive maintenance inspection and cleaning protocols. Establishment of performance standards will then be more effective and easy to track.

The implementation of the new MIS, with its ability to track workflow from problem identification to resolution, will greatly enhance the Commission's management ability to allocate resources needed for implementation of the LTPMP and trend outcomes.

FIGURE 6-2

Workflow Activity Diagram for Scheduled Maintenance Activities

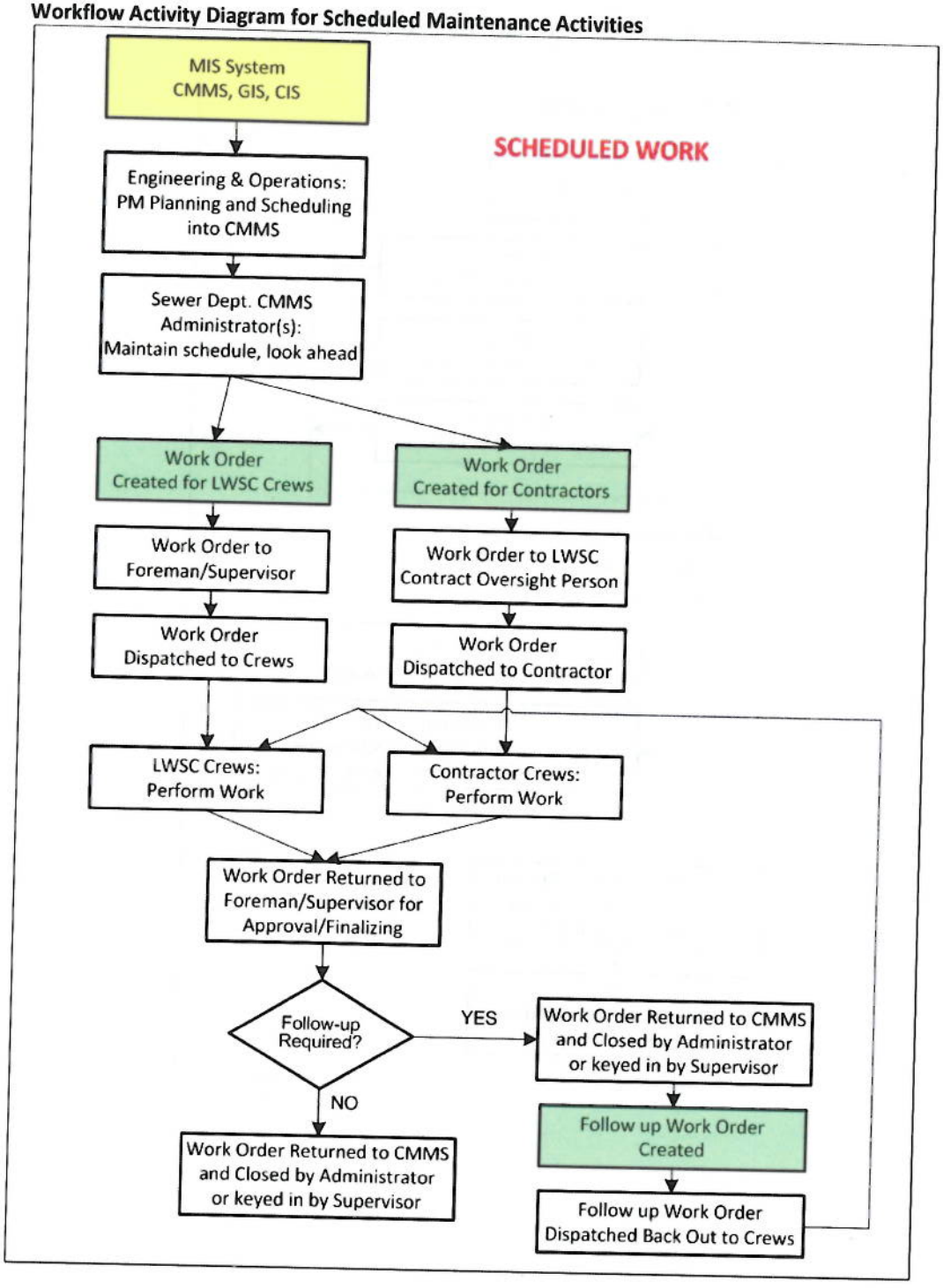
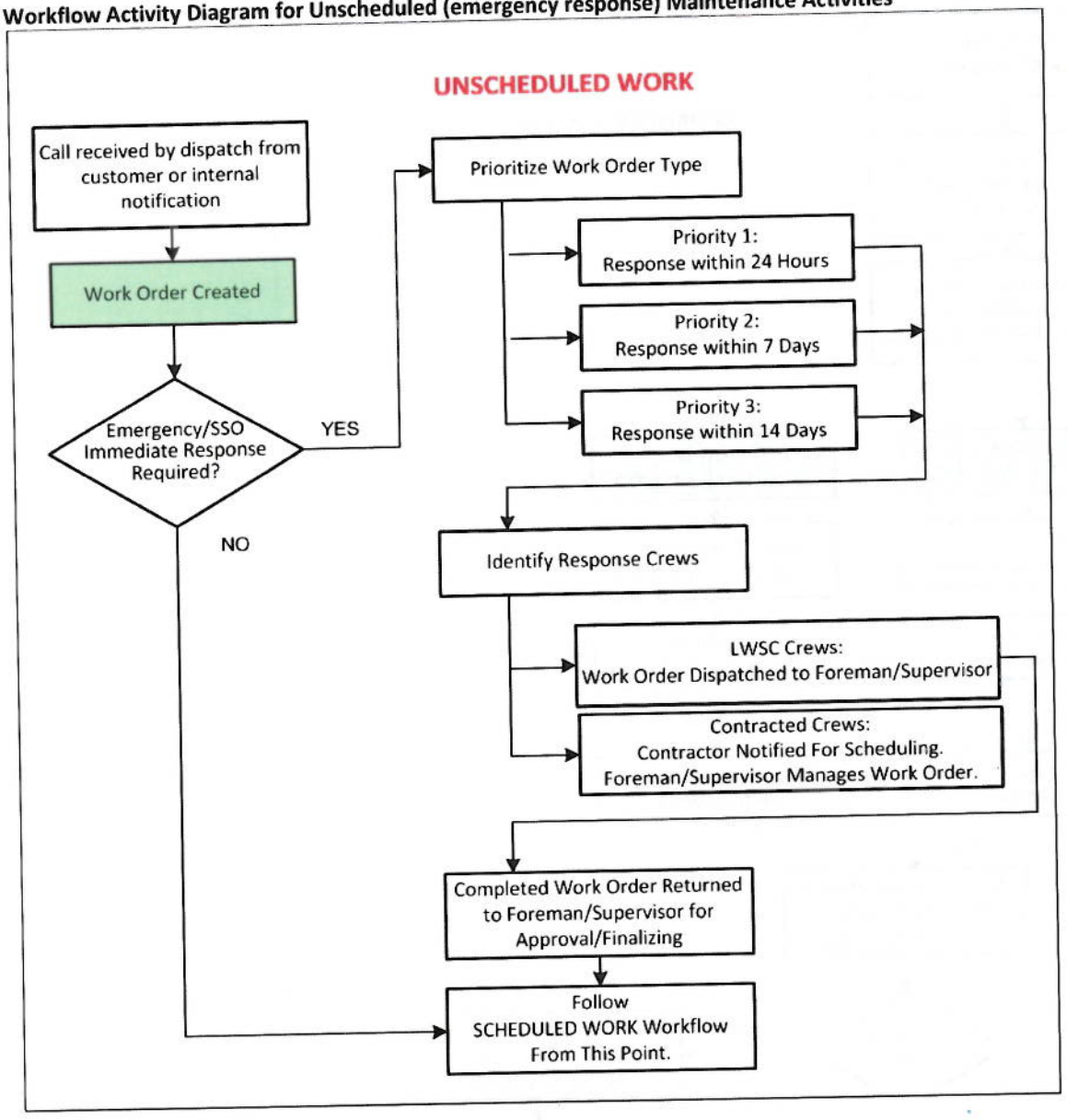


FIGURE 6-3

Workflow Activity Diagram for Unscheduled (emergency response) Maintenance Activities



SECTION 7

Performance Measures

The following list of benchmarking statistics will be tracked from year to year and used to measure performance of the LTPMP:

- Actual number of manholes inspected versus planned number
- Actual gravity line cleaning footage completed versus planned footage
- Actual CCTV inspection footage completed versus planned footage
- Actual number of catch basins cleaned versus planned number
- Number of SSOs and root causes.
- Number of pump station failures due to insufficient maintenance
- Average annual spending on preventive maintenance as a percentage of estimated total collection system value

Although these metrics may not track everything associated with the LTPMP implementation, changes in these parameters over time will indicate the overall success of the plan or, conversely, underlying problems that can then be investigated further. Performance measures and reporting will be further developed as the LTPMP evolves.

SECTION 8

Training and Safety

8.1 Overview

The objective of staff training is to educate employees involved in implementing the LTPMP plan on how to perform and document the procedures in the program. Before the field personnel engage in routine field activities such as pipe cleaning, they need to be given training and instruction that includes the following areas:

- Equipment operation
- Work zone and traffic area safety
- Use of personal protective equipment (PPE)
- LWSC safety policies, including confined space entry
- Applicable OSHA safety regulations

Safety Training Program is described in 8.4.

8.2 Training Methods

The LTPMP recommends utilizing the following methods to train the staff involved in the program implementation:

- On-the-job training (OJT), carried out by having experienced employees provide direct field training and guidance to new employees. The experienced employees observe performance of trainees through field observation and track progress of their skills and knowledge improving.
- Peer assessments, performed by having competent employees assess whether the trainees are fully trained.
- Classroom training, offered to the employees by having them attend on-site or off-site workshops or webinars.

8.3 Effectiveness of Training

Training for the selected employees will be tracked and documented. A record of training sessions will document the type of training, instructors' names, date and time, duration, subject and participants. S ign-in sheets and any handouts will be kept on file. Different approaches will be used to assess improvement in the competency of employees, e.g., informal comments of other employees, on the job observations, staff review sessions with all employees, and reports from peers, managers or customers.

8.4 Safety Training Program

Hazards in the collection systems are many and varied. The Commission's staff involved in implementation of LTPMP will receive the safety training as described herein.

Confined Space Entry Safety Training: This training will be conducted every other year to instruct employees on proper procedures as defined in OSHA 29 CFR 1910.146. The training includes:

- Identifying permit and non-permit required confined spaces
- The roles of the confined space supervisor, attendant, and entrant
- Gas detection systems
- Ventilation systems
- Personal Protective Equipment (PPE)
- Non-entry rescue equipment and procedures
- Applicable OSHA training

Excavation and Trenching Safety Training: This training will be supplied to train employees on methods and standards as defined in OSHA 29 CFR 1926.650. The training includes:

- Competent person responsibilities.
- Protective systems.
- Sloping and benching.
- Soil classification.
- PPE.

Hazard Communication Training: New employees receive "Right to Know" training. Refresher training will be supplied annually to employees that may encounter hazardous chemicals.

AED/CPR/First Aid Training: Special training including AED/CPR/First Aid certification will be offered to selected LWSC personnel across departments. Supplemental safety trainings will be offered on various topics such as back safety, heat stress, PPE, work zone design and awareness, fire training, asbestos. Monthly safety training sessions will be performed each month by supervisors covering safety issues pertaining to their job activities. Regular safety briefs are also done by supervisors and crew leaders.

Safety Measures: PPE provided by the LWSC includes, but is not limited to, hard hats, safety glasses, hearing protection, safety-toed shoes, work gloves, disposable vehicle floor mats, and Class III high visibility garments.

Outside contractors are required to provide the Commission with a copy of their safety policies or program for review. Contractors are expected to follow all LWSC safety policies and applicable OSHA regulations while performing contract work for LWSC.

Contractors performing work for these projects are contractually obligated to ensure the work site and the work of their employees meet federal, state, and local laws, statutes, and regulations, specifically including, but not limited to, safety requirements mandated by the OSHA.

SECTION 9

Implementation Schedule

The Corrective Action Plan (CAP) is pending. Pursuant to Consent Decree, the implementation of this LTPMP will begin on September 19, 2013 with the first progress report due on January 31, 2014. Upon approval of the LTPMP the Commission will submit a more detailed schedule including all activities and milestones.

Appendix A
Standard Operating Procedures (SOP)

A.1. SOP: Manhole Inspection/Pipe Lamping

Manhole inspection requires at least a two-man crew for man-entry inspections (one person to enter the manhole and the other in the clear to observe in the event of an emergency) and one-man crew for top-side manhole inspection.

Equipment includes a pole-mounted camera (standard waterproof digital camera or a specialized manhole zoom camera) and additional small and bright LED lighting as needed. Man-entry inspections require a tri-pod and winch in good operating condition. The following safety equipment must be used by all personnel working around open manholes and preparing to enter the manhole:

Approved gas detector (properly calibrated);

Fresh air blower;

Safety harness, rope, and tripod safety system; and

An approved hard hat.

Standard operating procedure (SOP) is performed as follows:

- Set up traffic control at manhole location. Use barricades and/or warning devices to direct traffic around open manholes.
- Remove manhole cover (prior to opening the manhole, test atmospheric conditions through an available opening).
- If performing man-entry inspection:
    - Test the atmosphere inside the manhole by using an approved gas monitor, through an available opening which is lowered into the confined space to test atmosphere at three levels (top, middle and lower part of the manhole). Get readings of carbon monoxide (CO), hydrogen sulfide (H2S), oxygen, lower explosive limit (LEL) of Methane and toxic concentrations of vapors which measured in terms of the Threshold Limit Value (TLV). The manhole must be tested at each level for a minimum of 60 seconds.
    - Ventilate the manhole if combustible gases, hazardous vapors or oxygen deficient atmosphere is detected. Use a higher capacity portable blower and place the end of the blower hose straight down into the manhole as far as possible (at least 2 feet below the chimney).
    - Enter the manhole. If permanent ladder steps are not provided in the manhole, use an aluminum ladder in good operating condition shall be used to enter the manhole. A person entering the manhole must have safety harness, rope, and tripod safety system attached.
- If performing top-side manhole inspection:
    - Insert a pole-mounted camera into the manhole.
- Inspect manhole visually for cracking, deterioration, infiltration, insects, debris, grease, roots, sticks, or any other obstructions. Enter observations into a Manhole Inspection Form.
- If pipe lamping is performed:
    - Visually inspect each sewer or storm sewer line connected to a manhole within viewing distance of the manhole and check pipe condition and extent of accumulation of debris, grease, roots, sticks, or any other obstructions that could cause a backup in the collection system upstream. Enter observations into a Manhole Inspection Form.

- Once the inspection is complete, apply a small patch of tar (manhole cover sealer) as needed to a manhole ring to prevent rocking or rattling and cover manhole.
- If traffic control requires adjustment for the next setup, pick up the cones and reset the taper.
- Complete a Manhole Inspection Form noting any condition(s) visible. If structure needs maintenance or immediate attention notify Foreman/Superintendent so that appropriate measures can be performed or the manhole can be rehabilitated.

General manhole safe work practices:

- Use caution when working around manholes.
- Do not smoke, light open flames, or produce sparks in the immediate vicinity of open manholes.
- Lift manhole covers and heavy hatches with the legs. Never lift with the back muscles.
- Lay removed manhole and heavy hatch covers flat on the ground several feet away from the opening.
- When manhole or entrance covers are removed, the opening must be promptly guarded by a railing, temporary cover, or other temporary barrier that will prevent an accidental fall through the opening and protect each employee working in the space from foreign objects entering the space.
- Use barricades and/or warning devices to direct traffic around open manholes.
- Follow Confined Space Entry Program General Rules and Regulations and all safety procedures before entering and during entry into any manhole.
- Have at least two persons present before entering a manhole: One person to enter the manhole and the other in the clear to observe in the event of an emergency.

A.2. SOP: Sewer Line CCTV Inspection

CCTV inspection of a sewer line requires a two-man or three-man crew: one CCTV system operator (must be a certified National Association of Sewer Service Companies (NASSCO) Pipeline Assessment and Certification Program- (PACP) trained operator using established PACP coding and observations) and other crew member(s) assisting the operator in setting up and using the equipment.

The following are the steps in the SOP:

- Cleaning (if performed):
  - Clean the sewer by removing grit, loose solids, grease, and any other debris present in the pipe.
  - Complete the cleaning within 72 hours and no less than one hour prior to inspection to reduce the impact of the natural flow within the pipeline during inspection.
  - Trap all debris at the end manhole and properly dispose and haul away debris.
- Mount a CCTV camera on transport platform that will keep it centered along longitudinal axis of sewer mainline and above water.
- After the equipment set-up preparation is completed (i.e., power tested, camera focused to a pre-set distance, and the line strung), lower the camera assembly down the sewer line from the upstream maintenance hole by one of the workers (upstream winch cable operator).
- Place a CCTV camera at center of manhole and commence video before entering pipe: check the TV monitor to see if is getting a satisfactory picture and lighting.
- All footage readings must be estimated as closely as possible and should always start at the CENTER of the maintenance hole so the repair crews will always measure from the same point.
- Operation:
  - Record section of sewer in its entirety with no breaks or interruptions.
  - Show inside of manhole walls, manhole channel, and pipe connection to wall at both upstream and downstream manhole and lateral connections.
  - Move through line at speed no greater than 30 feet per minute stopping for minimum 10 seconds to record lateral connections, mainline connections, defects, and features and points of interest.
  - Maintain technical quality, sharp focus, and distortion free picture.
  - Pan, tilt, and rotate as necessary to best view and evaluate lateral connections, defects, features, and points of interest.
  - Use power winches, powered rewinds, tractors, or other devices that do not obstruct camera view or interfere with proper documentation of sewer conditions to move camera through sewer.
  - Eliminate steam in line for duration of inspection.
  - Utilize blower as needed to defog sewer line.
- If obstruction in a line is not passable, withdraw CCTV equipment and perform inspection from opposite end.
- Measurement for location of defects and service laterals: Use measuring target in front of television as exact measurement reference point.
- Field Documentation should include:
  - Contract Number and Project Name
  - Basin name

- Contractor
- Operator name
- Date and time (begin to end inspections)
- Weather conditions
- Q.A. Reviewer name
- DVD number and index
- General physical conditions, footage locations, clock position, and descriptions of defects and estimated leakage rates for visible point sources of infiltration/inflow (I/I)
- Mainline inside pipe diameter and type
- Manhole identification (upstream and downstream manhole)

A.3. SOP: Hydraulic Cleaning

Hydraulic cleaning requires a two-man crew. The equipment includes a sewer jetter and a vactor, and a debris trap.

Standard procedure for hydraulic cleaning activities is as follows:

Any and all required traffic control signs, cones and other devices must be in place prior to initiating work activities in or around traffic.

Crews are provided with daily Work Orders for hydraulic cleaning and CCTV inspection activities.

All hydraulic cleaning equipment is expected to be operated and maintained per manufacturer's recommendations.

Potable water obtained from fire hydrants is generally used for hydraulic cleaning. The number of loads must be documented. Non-potable water may be used if available (if cleaning is performed near the WWTP).

If accessing manholes, confined space entry equipment must be in use and procedures followed.

In freezing temperatures, if water is present on the road surface, salt shall be applied to the road surface.

Hydraulic cleaning is completed in the **upstream direction**. Cleaning activities are performed in conjunction with vacuum removal of debris and cleaning water.

Cleaning Operation

- Insert the debris trap.
- Start the auxiliary engine.
- Lower the hose, with a guide or roller to protect the hose, into the manhole and direct it into the sewer to be cleaned.
- Start the high pressure pump and set the engine speed to provide adequate pressure for the sewer cleaning operation.
- Open the water valve and allow the hose to proceed up the sewer. The hose speed should not exceed 3 feet per minute.
- Allow the hose to proceed 25 percent of the length of the sewer and pull the hose back.
- Observe the nature and the quantity of debris pulled back to the manhole. If there is little or no debris, allow the hose to proceed to the upstream manhole. If there is moderate to heavy debris, clean the remaining portion of the sewer in steps not to exceed 25 percent of the length of the sewer.
- Open the upstream manhole and verify that the nozzle is at or past the manhole.
- The sewer has been adequately cleaned when three successive passes with a cleaning nozzle do not produce any additional debris
- Determine the nature and quantity of the debris removed during the cleaning operation. Use the criteria in Table to report the nature and quantity of debris.
- Remove the debris from the manhole using the vacuum unit.
- Rewind the hose on the reel.
- Remove the debris trap.

All hydraulically cleaned line segments must be inspected via CCTV in a timely manner. In most cases, the inspection will be completed the same day or the next scheduled work day. The CCTV inspection should be completed within two weeks of the initial cleaning date.

Clean the mating surface and close the manholes. All manhole covers must be completely reseated after cleaning and CCTV inspection activities.

Enter cleaning results and other pertinent information on Work Orders and daily time sheets.

Following completion of the work, the cleaning unit is moved and all traffic control devices shall be removed without delay.

Collected debris is transported to the WWTP for disposal.

A.4. SOP: Mechanical Cleaning

Mechanical cleaning requires a two-man crew.

Standard procedures for mechanical cleaning activities are as follows:

Any and all required traffic control signs, cones and other devices must be in place prior to initiating work activities in or around traffic.

Crews are provided with daily Work Orders for hydraulic cleaning and CCTV inspection activities.

If accessing manholes, confined space entry equipment must be in use and procedures followed.

In freezing temperatures, if water is present on the road surface, salt shall be applied to the road surface.

Perform all cleaning in the **downstream direction**.

Observe and follow all manufacturers' operating instructions and/or maintenance procedures for the equipment.

Remove material from the downstream manhole.

Beware of the potential for mechanical cleaning equipment to become lodged in the sanitary sewer lines. This can increase the severity of the line blockage and result in the need for excavation and an emergency point repair to remove the equipment.

Collected debris is transported to the WWTP for disposal.

Reseat all manhole covers after cleaning activities.

All manhole covers must be completely reseated after cleaning and CCTV inspection activities

Secure all equipment, tools and/or other materials prior to leaving work area.

Following completion of the work, all traffic control devices shall be removed without delay.

Cleaning results and other pertinent information is recorded on Work Orders and daily time sheets.

A.5. SOP: Sealing Manhole Cover for Noise and/or Odor Control

Sealing manhole cover for noise or odor control requires a two-man crew.

Standard procedure is as follows:

- Remove the manhole cover and use the gas detector to determine if it is safe to proceed with the cleaning operation.
- Sweep ring of manhole with a broom.
- Get out caulking gun and cartridge of roof cement. Cut tip off cartridge. Puncture seal in tip. Load cartridge into caulking gun.
- Squeeze trigger of caulking gun until black caulk starts to come out. Squeeze 3-4 large beads of caulking around manhole ring.
- If the purpose of sealing the manhole cover is to control the odor, squeeze out a bead of caulking around the entire ring of manhole. Secure the manhole cover back into the manhole ring and close manhole.
- If the purpose of sealing the manhole cover is to control the odor, after closing the manhole, squeeze out caulking in holes on top of manhole cover.

A.6. SOP: Catch Basin Cleaning

Catch basin cleaning requires a one-man crew (minimum).

Standard operating procedures for catch basin cleaning activities are as follows:

- Do visual inspection on outside of grate and check the following:
  - Not to grade catch basin frame
  - Damaged grate and/or cover
  - Deteriorated brickwork and concrete
  - Broken or missing catch basin hood
  - Evidence of flooding conditions
- Do inside visual inspection to see if and what needs to be cleaned.
- Clean sediment and trash off grate and from the sump of the basin.

  If a clamshell bucket truck and a sump pump are used:
  - Collect water from the sump using a sump pump while taking care not to disturb sediment.
  - Discharge the collected water directly to the sanitary sewer line nearby.
  - Lower the bucket into the catch basin and grab the dirt and debris, raise the bucket up and unload into the truck.
  - Drive to a designated location to dump sediment.

  If a jetter and vacuum truck are used:
  - Start sucking out standing water and sediment.
  - Use a high pressure water to clean any remaining material out of catch basin, while capturing the slurry with the vacuum.
  - When vacuum truck is full of sediment dispose the cleanings as follows:
    - Option I: Drive to the designated location and dump all the sediment out of truck into a drying bed. When it dries, it will be cleaned up with a backhoe, put into a dump truck and taken to the landfill.
    - Option II: Discharge into a WWTP.
    - Move to the next catch basin.

A.7. SOP: Pump Station Inspections

Pump station inspection requires a one-man crew.

Daily (5-Times per Week Inspection Schedule)

Visually inspect the station for vandalism.

Clean up any trash or debris material.

Wash down wet well.

Place pump controls back in auto position prior to leaving station.

Lock up station, including exterior power panels if required, prior to leaving.

Complete all required paper work.

Weekly

- Record pump hours and rates for each pump.
- Run each pump in hand and watch the level control go up and down to ensure pumps are operating properly.
- Open up wet well and visually inspect the pumping action of each pump.
- Check wet well floats for rag build-up, clean as needed.
- Test all panel lights and change as needed to ensure proper operation.
- Inspect alarm system and electrical components.

Monthly Inspection Schedule

Completely pump down the wet well to its lowest point and make a visual inspection.

Hose the wet well down during the pump down process.

Inspect wet well for excessive grease build up on surface, clean when needed.

Check wet well floats for rag build up, clean as needed.

Check pumps and piping visually for defects.

Check power back-up generator. Start to ensure working condition. Check fuel level and battery condition.

Turn in operations log sheets at end of the month.

Annually

Clean grit and grease from the wet well using a vacuum truck.

Calibrate flow rate metering equipment.

Operate generator under load for 30 minutes. Test to be conducted by tripping power to the station and observing a successful transfer to generator power.

A.8. SOP: Power Backup Generator Inspections

Power backup generator inspection is performed by one person.

Daily/Weekly

- Visually inspect emergency generator for fuel and ability to operate properly.

Monthly

- Power backup generator needs to be checked, and started (fuel level, battery and general condition).
- Generator is to be operated, under load, for 15 minutes. This test is to be conducted by tripping power to the station and observing a successful transfer to generator power.

Quarterly

- Emergency generators are to be operated per manufacturer's requirements and in compliance with operating permits.

Appendix B
Forms

B.1. LWSC Work Orders

LYNN WATER SEWER COMMISSION — **SEWER DAILY WORK SHEET**

DAY _____ **DATE** _____

Emergency	Truck #	Location	Change of Location
Brooks			
Catch Basin Cleaning			
Vactoring /Jetting /Snaking			
Contractors:			
Catch Basin Repairs			
Sewer, Drain, New Construction			
Supervisor			

Name	Grade	Sick	Vac.	Comp.	Comments:
Capano	Superintendent				
Donahue	Foreman				
Harris	W. Foreman				
Brown	W. Foreman				
Navaroli	W. Foreman				
Wilson	C. L – I				
Cooke	C. L – 1				
Donahue Jr.	C. L – 2				
Bassetti	Emergency C/2				
Barry	C.I. 3				

B.2. Sample CCTV Inspection Form

CUES, Inc.
3600 Rio Vista Avenue
Orlando, FL 32805
Phone: 407-849-0190
Fax: 407-425-1569

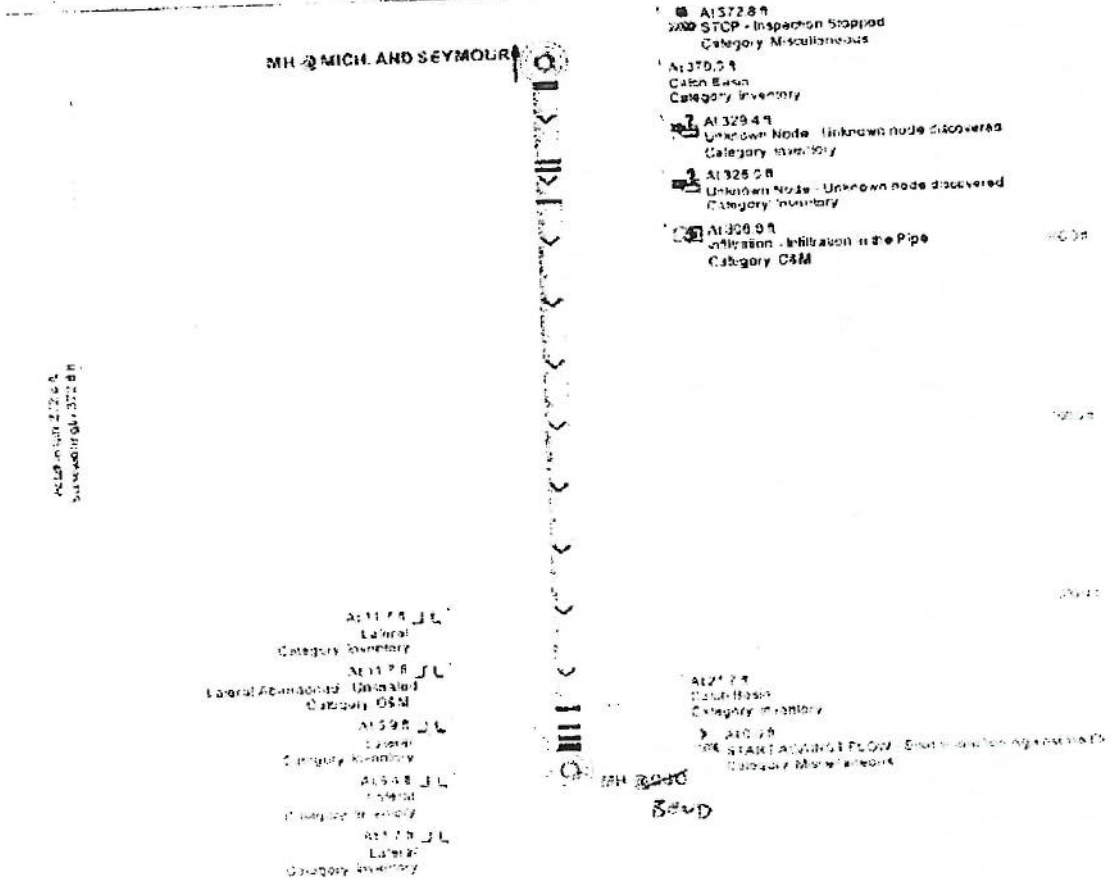
RANTE

Main Inspection With Pipe Run Report

Project Name:	Mainline ID:	City:	Address:
CITY OF LYNN	1981161515	LYNN	MICHAGIN ST

Start date/time:	Pipe width:	Pipe height:	Pipe type:	Surface condition:
8/5/2011	36	36	Other	Asphalt

Direction:	Surveyed footage:	Weather:	MEDIA_LABEL
UPSTREAM	372.8	Dry	



B.3. Manhole Inspection Form

Lynn Water and Sewer Commission

MANHOLE INSPECTION FORM

1. Date:	
2. Time:	
3. Crew:	
4. Inspection Status:	
5. Pre-Cleaning Date:	6. Purpose of Survey: ☐ 7 Man-entry inspection ☐ 8 Pipe lamping ☐ 9 MH camera
10 Video File Name:	
11. MH#/Struct ID:	12. Map #:
13. Street Name & #:	
14. Further Location Details:	

3

15. Manhole Use:		27. I&I Potential:	Y N	30. Coordinate System:	
16. MH Location Code:		28. Evidence of Surcharge?	Y N	31. Verified: ☐ North.(Y) ☐ East. (X) ☐ Elev.(Z)	
17. MH Surface Type:		29. Subject to Dirt or Debris?	Y N	32. Accuracy of GPS Code: ☐ Confirmed	
18. Outgoing Rim to Invert:	ft	39. Additional Information (Sketch map):			
19. Outgoing Grade to Invert:	ft				
20. Rim to Grade:	ft				
21. Cover Type / Lid Diameter:	in.				
22. # of Holes in Lid/Hole Dia. Code	in.				
23. Cover/Frame Fit:					
24. Barrel Diameter:	in.				
25. Steps Present?	Y N				
26. Rodents:					
33. Initial Gas Detector Levels	O2:	H2S:	LEL:	CO:	

PHYSICAL DATA

	Material	Condition	Comments:
Lid:			
Frame:			
Grade Rings:			☐ solid ☐ adjustable
Cone:			☐ Flat-top ☐ Concentric ☐ Eccentric Lined? Y N
Barrel/Wall:			Lined? Y N
Bench/Shelf:			Lined? Y N
Channel/Trough:			☐ Pipe ☐ Formed ☐ Precast ☐ Insert

Connecting Pipes:	Dia (in)	Material	Grease-Debris-Root	% Filled	Seal:	Pipe Condition/Comments
#1			☐ ☐ ☐			
#2			☐ ☐ ☐			
#3			☐ ☐ ☐			
#4			☐ ☐ ☐			

OVERALL RATING

- ☐ Good/Satisfactory
- ☐ Debris/Solids Buildup in MH
- ☐ Needs Maint (describe in comments)
- ☐ Needs Repair (describe in comments)

*Sample Comments: Poor structural condition, Serviceable, Broken, Unsafe, Damaged, Corroded, Missing Grout Needs Raising, Needs Lowering, Misaligned, Leaking Ill-fitting, Dirty, Bad joint, Roots, Grease, Infiltration, Cracks

OVERALL COMMENTS:

B.4. Sewer Cleaning Form

Lynn Water and Sewer Commission

SEWER PIPE CLEANING FORM

1. Date:	
2. Time:	
3. Crew:	***4. Cleaning Status:***
4. Type of Pipe:	
4. Upstream MH#/Struct ID:	12. Map #: ☐
5. Downstream MH#/Struct ID:	
6. Further Location Details:	
7. Pipe Length: LF	8. Diameter: in 9. Shape:
10. Material:	

7 Purpose of Cleaning

- ☐ Preventive Maintenance
- ☐ Pipe Blockage Removal
- ☐ Part of SSO Cleanup
- ☐ Pre-Rehabilitation
- ☐ Pre-Inspection — Inspection Date:
- ☐ Post-Inspection
- ☐ Other:
- ☐ Other

8 Methodof Cleaning

- ☐ Hydraulic, jetting
- ☐ Vacuum
- ☐ Mechanical, rodding
- ☐ Mechanical, rooty cutters
- ☐ Other:

Material Removed

- ☐ Sand/silt
- ☐ Grease
- ☐ Roots
- ☐ Other

Cause of Blockage, if Applicable: